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Surgery Duration Predicts Urinary Retention after Inguinal Herniorraphy: A Single Institution Review

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Abstract

Background—Inguinal hernia repair, laparoscopic or open, is one of the most frequently performed operations in general surgery. Postoperative urinary retention (POUR) can occur in 0.2–35% of patients after inguinal hernia repair. The primary objective of this study was to determine the incidence of POUR after inguinal hernia repair. As a secondary goal, we sought to determine if perioperative and patient factors predicted urinary retention.

Methods—This study is a retrospective review of patients who underwent inguinal hernia repair with synthetic mesh at the Medical College of Wisconsin from January 2007 to June 2012. Procedures were performed by four surgeons. Clinical information and perioperative outcomes were collected up to hospital discharge. Urinary retention was defined as need for urinary catheterization post-operatively.

Results—A total of 192 patients were included in the study (88 bilateral, 46%) and (104 unilateral, 54%). The majority of subjects (76%) underwent laparoscopic repair. The overall POUR rate was 13%, with 25 of 192 patients requiring a Foley catheter prior to discharge POUR was significantly associated with bilateral hernia repairs (p=0.04), BMI≥35kg/m^2 (p=0.05) and longer operative times (p=0.03). Based on odds ratio estimates, for every 10-minute increase in operative time, an 11% increase in the odds of urinary retention is expected (OR 1.11, CI 1.004 – 1.223; p=0.04). For every 10-minute increase in operative time, an 11% increase in POUR is expected.

Conclusions—Bilateral hernia repairs, BMI ≥ 35kg/m^2, and operative time are significant predictors of POUR. These factors are important to determine potential risk to patients and interventions such as strict fluid administration, use of catheters, and potential premedication.

Keywords

inguinal hernia; urinary retention; operative time

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Introduction

Post-operative urinary retention (POUR) is a common complication after inguinal hernia repair, occurring in 12–15% of patients [1–4]. POUR is defined by the inability to urinate and need for urinary catheterization in the immediate postoperative period. Patient age, sex, and diagnosis of benign prostatic hyperplasia (BPH) have been previously described as risk factors for POUR [1–4]. The Laparoscopic totally extraperitoneal (TEP) repair has also been shown to increase the risk of POUR [3]. POUR leads to increased length of stay, increased discomfort, need for invasive catheterizations and increased costs [2,5].

The pathophysiology of POUR is multifactorial due to the complex nature of the micturition mechanism [1]. Factors such as obstruction, neuromuscular disruption, local inflammatory factors and over distention of the bladder have been implicated in the pathogenesis of POUR [1]. The urinary bladder holds between 400–600cc of fluid and prior studies have shown limiting fluid administration decreases the incidence of POUR [1,2,6,7]. Several studies have documented the adverse effects of both general and local anesthesia on the neuromuscular function of the bladder [1,2,8].

The primary objective for this study was to determine the incidence of POUR after inguinal hernia repair. As a secondary goal, we sought to determine if perioperative and patient factors predicted urinary retention.

Methods

An IRB approved retrospective review was undertaken to determine urinary retention in patients undergoing inguinal hernia repair with open and laparoscopic techniques over a five-year period (January 2007 to June 2012). All procedures were performed by four surgeons in similar fashion. For open inguinal hernias, urinary catheters were not routinely placed. General or local anesthetic with sedation were used depending on patient preference or cardiovascular risk factors. A standard Lichtenstein mesh repair was performed [10]. For laparoscopic inguinal hernia repairs, a totally extraperitoneal (TEP) approach was performed after the placement of a urinary drainage catheter. Procedure type was chosen based on a number of factors including patient preference, surgeon preference, bilateral or recurrent nature of the hernias. Perioperative and postoperative outcomes to time of hospital discharge were reviewed. Urinary retention was defined as need for urinary catheterization post-operatively.

Patients were excluded if they had a concomitant procedure during the same operative encounter or if they had other significant urologic issues such as trauma, malignancy, or reconstruction. Details regarding patient demographics, medical history, the surgical operation, and post-operative course were collected.

Statistical analysis was conducted using SAS 9.2 (SAS Institute, Cary, NC). Two-tailed Fischer’s exact test was used for bivariate analysis, and a backwards elimination logistic regression model that included all patient, hernia, surgical, and hospital information was used for multivariate analysis. In the final regression model, the unit for operation time was converted from one minute units to 10 minute units. It was determined that the impact of a

one minute difference in operative time on POUR was not clinically meaningful. A p-value < 0.05 was considered statistically significant.

Results

A total of 215 patients underwent inguinal hernia repair during the study period, of these 192 met inclusion criteria (10 excluded for undergoing other surgical procedures at time of repair, 10 excluded for incomplete data and 3 excluded due to prior urologic trauma). Population characteristics are included in Table 1. Of the 192 patients included 167 (87%) did not experience POUR and 25 (13%) experienced POUR (table 1). All POUR patients were male. The urinary retention group was associated with obesity (BMI ≥ 35) (p=0.05) (table 1).

Surgical information is described in Table 2. The incidence of POUR was associated with bilateral repair, increased duration of surgery, and greater LOS (Table 2). There was no significant difference in the amount or type of anesthesia (Table 2). Based on odds ratio estimates, operative time was the only predictor of POUR (OR 1.11, CI 1.004 – 1.223; p=0.04). For every 10-minute increase in operative time an 11% increase in the odds of POUR is expected.

No operative technical complications occurred in this series. Nine patients (4.7%) experienced events prior to discharge including nausea/vomiting (n=6; 3.1%), excessive pain (n=1; 0.5%), bloody urine (n=1; 0.5%), and intra-operative bradycardia/hypotension (n=1; 0.5%).

Discussion

POUR has been a well-documented complication of inguinal hernia repairs and leads to significant increase in cost, morbidity, and length of stay for patients [1–4]. This study investigated a single institution’s results and risk factors of inguinal hernia repair with respect to POUR. The risk of POUR in this study was 13% and is within the range of previously published literature of 0.2–25% [1–4]

This is the first study to show an increase risk of POUR for patients with increased BMI. Patients with increased BMI have increased obstructive urinary symptoms, comorbid conditions associated with neuropathies, and increased volume of distribution of commonly used anesthetic agents that could explain the pathophysiology of this result [9,11]. However, prior studies investigating POUR have not identified BMI as a risk factor potentially due to their patient population having lower BMI’s. It has been well documented that patients with increased BMI have a higher risk of technical complications, recurrence, and infective complications [12–15]. Thus our result adds to the already well-documented increase in morbidity and cost associated with obesity and surgery.

In addition, duration of the operative repair has been well-documented to increase the risk of POUR [1,3]. The current study supports this prior conclusion and is the first study to give a tangible risk for increasing operative time. Logistic regression analysis showed an increase risk of 11% for every 10-minutes increase in operative time or a 66% increase for each hour.

The data in this series does not reflect the size of the hernia or the skill level of the resident assistant in the case, all of which can influence the operative time. This result does provide an estimate of increased risk based on operative time for recurrent repairs, increase BMI, and repairs that are coupled with another surgical operation, that potentially increase operative time from a technical perspective. This higher index of suspicion can help guide post-operative management by ensuring the patient is able to void prior to discharge from the hospital.

Factors previously identified as risk factors for POUR include age, sex, narcotic analgesia, volume of fluid administration, type of surgery, neurologic comorbidities, type of anesthesia and method of fixation [1–4]. Several studies have cited increasing age as a risk factor for POUR [1,16,17]. Men have been reported to have an incidence of 4.7% compared to 2.9% in females [16]. POUR has been studied within several specialties with a historical incidence of 82% in respect to arthroplasty and as high as 52% in anorectal surgery [1,18,19]. In regards to inguinal hernia, historical studies examining POUR have documented rates up to 70% [1]. While modern studies show open repairs to be more accurately between 0.2–25% [20]. However when compared to open repairs, laparoscopic repairs have a increased incidence of POUR [20]. The reason for the higher rate in laparoscopic repairs has been hypothesized to be due to the trend to catheterize the bladder in laparoscopic repairs as well as the procedure occurring within close proximity to the bladder. The use of catheters has been shown to cause urethral trauma, and bladder irritation which have been cited as potential etiologies for catheterizations causing POUR [1]. In this study, we found a similar rate or POUR between open and laparoscopic repairs.

The amount of fluid administered has been scrutinized as well, the consensus of these is minimizing the amount of fluid administered decreases incidence of POUR. This observation is attributed to minimizing the amount of bladder stretch during the perioperative period [2,3,7]. This study showed that longer operative time is associated with a higher incidence of POUR. Since fluid administration is typically constant during a procedure, longer operations tend to have more IV fluid administration. Our data is not able to determine if the cause of POUR is due to the length of procedure or the increased IV fluid administration given during the longer procedure.

Fixation technique has also been shown to be a significant factor. Koch et al and Garg et al showed a 27–35% incidence of POUR with tack fixation in TEP repairs and a 4–5% without fixation; while maintaining no significant increase in recurrence rates [7,21]. All of these factors are considerations now taken into account when performing inguinal hernia repairs to help minimize POUR. While all of these factors have been identified previously not all were able to be measured in this study or were frequent enough to draw meaningful conclusions.

The treatment of POUR has been studied but no definitive management protocol has been accepted. Our study used a protocol that placed a catheter at time of retention and then removal the following day. If the patient was unable to urinate the next morning then the patient was discharged with a leg bag and follow up with urology for a fill and void trial was completed. In a randomized control trial by Brahmachari et al they compared an in/out

catheterization protocol to overnight catheterization. 27.7% of patients in the in/out protocol required recatheterization and only 4.7% required catheterization after overnight catheter placement [22]. Antonescu et al showed no benefit of routine bladder scanning protocol in an effort to identify patients at risk of POUR. Patients were identified if on routine bladder scan they had >600cc to receive an in/out catheterization prior to discharge. They found no difference between POUR rates but did show time in hospital prior to discharge was increased [23]. Other studies have focused on medical prophylaxis with alpha 1-adrenoceptor antagonists such as prazosin and tamsulosin. Mohammadi-Fallah et al demonstrated a decrease from 15% to 2.5% with the administration tamsulosin in two doses, 6 hours preoperatively and 12 hours postoperatively [5]. Although there is no consensus protocol for POUR, risk modification, early identification, catheterization timing, and medical management are factors to consider when deciding on personalized treatment of this complication.

There are several limitations of this study. First was the reference to prior urinary symptoms. Although history of BPH and prior urologic disorders and surgeries were recorded, no formal urologic testing was completed prior to surgery. The presence of previous urologic symptoms was based solely on a reference within the medical record. Another limitation is that even though the majority of patients followed the institution's protocol of catheterization placement at time of retention followed by removal the following day, no data was collected on compliance or effectiveness of this protocol. Thus a prospective study could be conducted to both gather more data as well as compare catheterization protocols of treating POUR.

In conclusion, BMI, operative time, and repair of bilateral inguinal hernias were associated with a higher incidence of POUR in our experience. Postoperative urinary retention following inguinal hernia repair is a frequent occurrence that may lead to an unpredictable perioperative course and discomfort for patients. Patients and surgeons will benefit from protocols designed to identify those at risk and consistent management and effective prevention protocols. Further research is necessary to define these protocols.

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Table 1

Patient and hernia information

Variable	No Retention	Retention	Cumulative	*p* value
N	167 (87.0%)	25 (13.0%)	192	-
Mean Age (Min-Max)	53.3 (18.7 – 88.6)	59.0 (36.9 – 85.1)	53.3 (18.7 – 88.6)	0.290
BMI				0.05
<35 kg/m^2	155 (92.3%)	20 (80.0%)	175 (91.1%)	
≥35 kg/m^2	12 (7.2%)	5 (20.0%)	17 (8.8%)	
Sex				0.08
Male	146 (87.4%)	25 (100%)	171 (83.8%)	
History of BPH				0.33
Yes	19 (11.4%)	5 (20.0%)	24 (12.5%)	
Urinary Symptoms				1.00
Yes	10 (6.0%)	2 (8.0%)	12 (6.2%)	
Hernia Information				0.89
Primary/Initial*	150 (89.8%)	23 (92.0%)	173 (90.1%)	

* Indicating the first time a repair was attempted.

Table 2

Surgery and hospital information

Variable	No Retention	Retention	Cumulative	*p* value
Type				0.05
Bilateral	78 (46.7%)	17 (68.0%)	95 (49.5%)	
Unilateral	89 (53.3%)	8 (32%)	97 (50.0%)	
Approach				1.00
Laparoscopic	127 (76.0%)	19 (76.0%)	146 (76.0%)	
Other	40 (24.0%)	6 (24.0%)	46 (24.0%)	
Anesthesia				0.69
General	153 (91.6%)	24 (96.0%)	177 (92.2%)	
MAC	14 (8.4%)	1 (4.0%)	15 (7.8%)	
Inhalational Anesthesia Dose	2.9 (±2.0)	2.4 (±1.6)	2.9 (±1.9)	0.18
Operative time (min)	87.6 (±34.9)	104.2 (±48.2)	89.9 (±37.2)	0.04
LOS	0.2 (±0.5)	0.9 (±0.3)	0.3 (±0.5)	<0.01