

A Study on Identifying Clinical Predictors for Early Postoperative Urinary Retention

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Abstract:

Background: Postoperative voiding dysfunction occurs in patients undergoing surgery for urinary incontinence and pelvic organ prolapse, with estimates ranging from 2.5% to 24%. Urinary retention emerges as the most prevalent complication following pelvic reconstructive surgery. While postoperative urinary retention may initially cause minimal discomfort and be transient, if left untreated, it can lead to permanent damage to urinary function.

Methods: All patients scheduled for pelvic reconstructive surgery underwent a thorough clinical examination, including staging of pelvic organ prolapse according to the POP-Q quantification system and scoring of levator ani muscle tone using the Oxford scale. Preoperative uroflowmetry and post-void residue measurements were also performed. Pelvic reconstructive surgery was performed based on the surgeon's discretion. Details such as the type and technique of surgery, anesthesia type, duration of surgery, and blood loss were documented.

Results: A total of 35 cases were included in the study based on the inclusion and exclusion criteria. majority of patients experiencing early postoperative urinary retention in this study were multigravida (94.29%), meaning they had had more than one pregnancy. Most patients were also pre-menopausal (74.29%). Early post-operative urinary retention was observed in five patients, resulting in a prevalence rate of 5/35 (14.29%) following pelvic reconstructive surgery. Among nine patients, covert retention was experienced by three patients (60%), while overt retention was reported by two patients (40%),

Conclusion: Patients diagnosed with stage 3 pelvic organ prolapse exhibited a lower risk of postoperative urinary retention than those with stage 1 and 2 pelvic organ prolapse. These differences were statistically significant. Clinicians understanding of the condition and alertness in its diagnosis are crucial for ensuring successful care for patients undergoing surgical repair. Accurate prediction of early voiding dysfunction allows for appropriate preoperative counseling, and preventive actions could be beneficial for patients.

Keywords: Pelvic Reconstructive Surgery, Pelvic Organ Prolapse, Post Operative Urinary Retention.

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Introduction

Pelvic organ prolapse represents a notable health concern within the Indian population [1]. This condition manifests frequently among post-menopausal women [2] and exhibits a strong correlation with parity [3]. Primarily impacting the quality of life [4], pelvic organ prolapse entails a lifetime surgical risk of 11% for women, potentially leading to post-operative urinary retention, which if left untreated, can cause lasting urinary function impairment [5]. Urinary retention stands as the most common complication following pelvic reconstructive surgery, sometimes delaying normal voiding for days or even months and ranging from irritative symptoms to complete obstruction [6]. Postoperative voiding dysfunction, occurring in 2.5 to 24 percent of patients undergoing surgery for urinary incontinence and pelvic organ prolapse,

typically resolves in the short term but remains distressing to patients [7]. This complication extends hospital stays, increases costs, and induces anxiety in women [8]. Various risk factors, including the patient's age, genital hiatus size, prolapse stage, and levator ani tone, contribute to early post-operative voiding disorders in those with pelvic organ prolapse [1]. Post-surgical pain and muscle spasms limit voiding sensation, with the incidence of postoperative urinary retention varying across different surgical procedures [9]. Standardized treatment for postoperative urinary retention involves bladder catheterization, either prolonged or intermittent until normal voiding patterns return. However, this period often brings discomfort and restricted mobility, leading to patient frustration [10]. Recognizing postoperative urinary retention as

a significant determinant of immediate postoperative quality of life and patient satisfaction underscores the importance of clinicians' perception and vigilance in diagnosis for successful patient care. Accurate prediction of early voiding dysfunction preoperatively enables appropriate patient counseling [1]. The present was done to determine the prevalence of post-operative urinary retention in patients who had pelvic reconstructive surgery.

Material and Methods

This study is an observational cohort study approved by the institutional review board, conducted among patients who underwent pelvic reconstructive surgery. Informed written consent was obtained from all participants. The study aims to identify clinical predictors for early postoperative urinary retention following pelvic reconstructive surgery.

Inclusion Criteria:

1. Patients scheduled for pelvic reconstructive surgery, including pelvic floor repair with or without vaginal hysterectomy and vault prolapse repair, were included.
2. The above surgeries were performed in our hospital
3. Willing to participate in the study
4. Given written undertaking

Exclusion Criteria:

1. Patients with pelvic organ prolapse scheduled for hysterectomy with concomitant mid-urethral sling surgeries
2. Those requiring long-term catheterization due to intraoperative complications were excluded.

Preoperative Workup: All patients scheduled for pelvic reconstructive surgery underwent a thorough clinical examination, including staging of pelvic organ prolapse according to the POP-Q quantification system and scoring of levator ani muscle tone using the Oxford scale. Preoperative uroflowmetry and post-void residue measurements were also performed. Pelvic reconstructive surgery was performed based on the surgeon's discretion. Details such as the type and technique of surgery, anesthesia type, duration of surgery, and blood loss were documented. Patients were catheterized for a maximum of 72 hours, with the duration adjusted based on the type of surgery (48 hours for large cystoceles or 72 hours for sacrospinous fixation). Patients were encouraged to void 6-8 hours after catheter removal and post-void residual volume was recorded using ultrasound. For patients with a post-void residue greater than 300ml and comfortable voiding, further attempts at voiding were

encouraged. Repeat post-void residue measurements were conducted for patients experiencing frequency or a sense of incomplete voiding.

If the post-void residue was greater than 300ml, or if the patient was unable to void or experienced symptoms of distention, catheterization for 72 hours was performed. Patients were again encouraged to void after this period. Those who failed to void were either catheterized for 7 days or taught intermittent self-catheterization. If normal voiding patterns were not restored after 7 days, patients were scheduled for urodynamic evaluation. All information was computerized, and confidentiality was maintained.

Analysis: Risk factors associated with early postoperative urinary retention were analyzed. The primary outcome was to determine the prevalence of early postoperative urinary retention and its correlation with the stage of prolapse. The secondary outcome was to identify clinical predictors for early post-operative urinary retention.

Statistical Analysis: The prevalence of postoperative urinary retention was expressed as a percentage, with a corresponding 95% confidence interval estimated. Descriptive statistics for continuous covariates and categorical risk factors were presented as mean (SD) and frequencies (%), respectively. The association between clinical predictors and early postoperative urinary retention was assessed using either the chi-square test or Fisher's exact test in univariate analysis. Clinical predictors showing significance at a level of less than 0.10 in univariate analysis were included in multiple logistic regressions to evaluate their independent association with early postoperative urinary retention. A p-value of less than 0.05 in multiple logistic regression indicated the corresponding risk factor as an independent predictor. The association of risk factors with post-operative urinary retention in multiple logistic regression was depicted by odds ratio and its corresponding 95% confidence interval.

Results

A total of 35 cases were included in the study based on the inclusion and exclusion criteria. Table 1 summarizes the demographic profile of participants included in a study, focusing on age and Body Mass Index (BMI). The majority of participants were over 50 years old (71.43%). A smaller percentage fell within the under-50 age group (28.57%). The most common BMI category was "Normal" (37.14%). "Underweight" and "Overweight" categories followed closely with similar percentages (25.71% and 31.43%, respectively). Only a small percentage of participants were "Obese" (5.71%).

Table 1: Demographic profile of the cases included in the study

Age	Frequency	Percentage
Less than 50 years	10	28.57
More than or \geq 50 years	25	71.43
BMI		
Underweight	9	25.71
Normal	13	37.14
Overweight	11	31.43
Obese	2	5.71

Table 2 shows that the majority of patients experiencing early postoperative urinary retention in this study were multigravida (94.29%), meaning they had had more than one pregnancy. Most patients were also pre-menopausal (74.29%).

Multiparity can be associated with weakened pelvic floor muscles, which may contribute to urinary retention after surgery. Hormonal changes associated with menopause can also affect bladder function and increase the risk of urinary retention.

Table 2: patient distribution in Early Postoperative Urinary Retention

	Frequency	Percentage
Parity		
Primigravida	2	5.71
Multigravida	33	94.29
Menopause		
Pre menopause	26	74.29
Post menopause	9	25.71

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with weakened pelvic floor muscles, which may contribute to urinary retention after surgery. Hormonal changes associated with menopause can also affect bladder function and increase the risk of urinary retention.

Table 3: Patient Characteristics in Early Postoperative Urinary Retention

	Frequency	Percentage
Size of Genital Hiatus		
< 5 cm	8	22.86
\geq 5 cm	27	77.14
The tone of Levator Ani Muscle		
1, 2	2	5.71
3	20	57.14
4, 5	14	40.00
Type of Surgery		
PFR	1	1.44
VH-PFR	25	70
VH-PFR+SSF	7	21.42
Vault repair with SSF	2	07.14
Duration of Surgery		
Less than 2 hours	12	32.86
\geq 2 hours	23	67.14

Table 3: provides details about various patient characteristics potentially associated with early postoperative urinary retention.

Size of Genital Hiatus: Most patients (77.14%) had a genital hiatus larger than or equal to 5 cm. A wider genital hiatus might indicate weaker pelvic floor muscles, potentially increasing the risk of urinary retention.

Tone of Levator Ani Muscle: The majority of patients (57.14%) had a Levator Ani muscle tone of 3, followed by 4 or 5 (40%) and 1 or 2 (5.71%). Higher Levator Ani muscle tone (grades 4 or 5) generally indicates stronger pelvic floor muscles, possibly associated with a lower risk of urinary retention.

Type of Surgery: Most patients underwent Vaginal Hysterectomy Pelvic Floor Repair (VH-PFR) (70%), followed by VH-PFR + Sacrospinous

Ligament Fixation (SSF) (21.42%), Vault repair with SSF (7.14%), and Pelvic Floor Repair only (PFR) (1.44%). Surgeries involving extensive pelvic floor manipulation or repair might carry a higher risk of urinary retention compared to simpler procedures.

Duration of Surgery: Two-thirds of patients (67.14%) had surgery lasting 2 hours or longer, while the remaining third (32.86%) had surgeries under 2 hours. Longer surgery duration might be associated with increased tissue manipulation and inflammation, potentially contributing to urinary retention.

Table 4 shows the operative patient characteristics in early postoperative urinary retention.

Intraoperative Blood Loss: The majority of patients (65.72%) experienced blood loss less than

500 ml during surgery. Interpretation: Higher blood loss could indicate more extensive surgical manipulation, potentially impacting pelvic floor nerves and increasing the risk of urinary retention. However, the data here suggests most patients had minimal blood loss, making this a less likely explanation.

Anesthesia: Most patients received spinal anesthesia (68.57%), followed by others (17.14%) and general anesthesia (14.28%). Spinal anesthesia can lead to temporary bladder paralysis, which might contribute to urinary retention after surgery. However, the use of other types of anesthesia could also have associated effects on bladder function. More information on the specific "other" anesthetic types used might be helpful for further interpretation.

Table 4: Operative Patient Characteristics in Early Postoperative Urinary Retention

	Frequency	Percentage
Intra Operative Blood Loss		
< 500 ml	23	65.72
>/= 500 ml	12	34.28
Anesthesia		
Spinal	24	68.57
General	5	14.28
Others	6	17.14

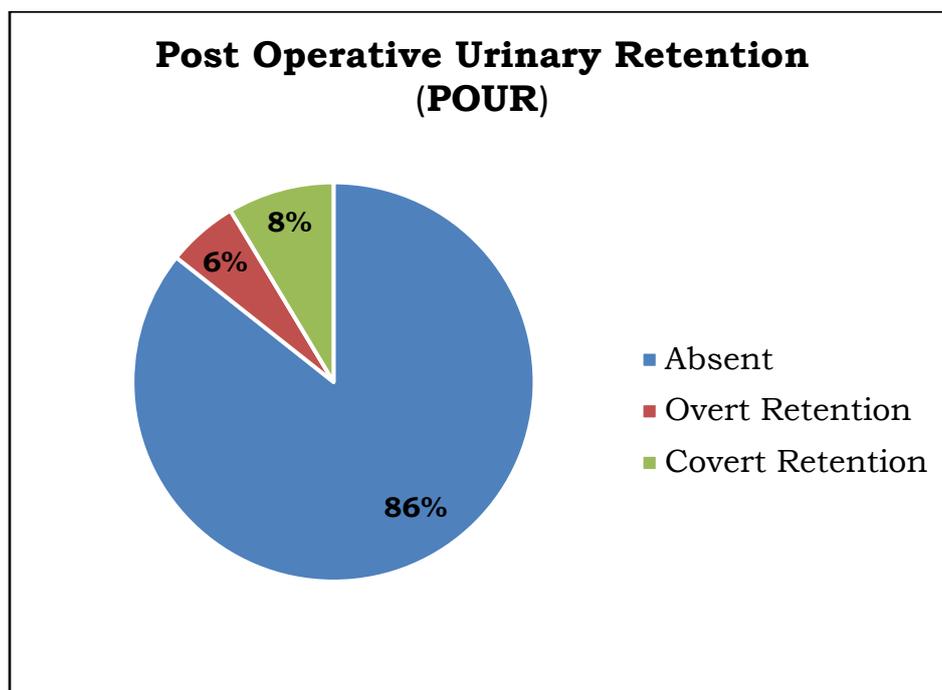


Figure 1: Prevalence of Postoperative Urinary Retention in the cases of the study.

Early post-operative urinary retention was observed in five patients, resulting in a prevalence rate of 5/35 (14.29%) following pelvic reconstructive surgery. Among nine patients, covert retention was experienced by three patients (60%), while overt retention was reported by two patients (40%), as illustrated in Figure 1.

Among the five patients, one required urodynamic assessment. Following referral to urology, she underwent evaluation and was diagnosed with atonic bladder, characterized by underactive detrusor with overflow incontinence. She elected to undergo clean intermittent catheterization.

Table 5: Comparison of postoperative urinary retention (POUR) with the stage of prolapse in the cases of the study

Stage of prolapse	POUR		P value
	Present	Absent	
1,2	2(40%)	1(3.33%)	0.0413
3	3(60%)	19(63.33%)	
4	0(00%)	(33.33%)	

Table 5 shows four stages of prolapse: Stage 1 & 2, Stage 3, and Stage 4. There is a positive association between the presence of POUR and the severity of prolapse. Stage 1 & 2: 40% of patients with this stage had POUR, while only 3.33% in the "POUR absent" group had this stage. However, the p-value (0.0413) suggests marginal statistical significance. Stage 3: The majority (60%) of patients with Stage 3 had POUR, compared to 63.33% in the "POUR absent" group. This suggests a weaker association with higher stages. Stage 4: No patients with Stage 4 prolapse had POUR, while 33.33% in the "POUR absent" group had this stage. This strengthens the potential correlation between POUR and prolapse severity.

Discussion

The lifetime risk for women undergoing surgery due to prolapse or incontinence is reported as 11% [11]. Post-surgical pain and muscle spasms restrict voiding sensation, potentially leading to urine retention. Estimates suggest that postoperative voiding dysfunction affects 2.5-24% of patients undergoing surgery for urinary incontinence and pelvic organ prolapse [6]. In this study, we found the incidence of urinary retention in 14.29% of cases. Urinary retention emerges as the most prevalent complication following pelvic reconstructive surgery. While post-operative urinary retention may initially cause minimal discomfort, failure to alleviate it can result in permanent urinary function impairment [5]. Following pelvic reconstructive surgery, patients may experience prolonged periods before resuming normal voiding. Voiding dysfunction can manifest with various symptoms ranging from irritative to obstructive, necessitating continuous bladder drainage immediately after vaginal surgery for pelvic organ prolapse [6]. In this study, most of the cases were equal to or above 50 years. It has been shown that post-operative urinary retention shows a notable increase with age, with patients over 50 years of age experiencing a 2.4-fold higher risk [12]. Numerous studies have highlighted age as a predictor of postoperative voiding efficiency. Keita's study identified age ≥ 50 years as an independent predictive factor for postoperative urinary retention [13]. This association may be attributed to age-related progressive neuronal damage, which can lead to bladder dysfunction [12]. Additionally, aging and parity are linked to fibrosis, variations in fiber diameter, and centralization of nuclei in the Levator Ani muscle. In the current

study, most patients (77.14%) had a genital hiatus larger than or equal to 5 cm. A wider genital hiatus might indicate weaker pelvic floor muscles, potentially increasing the risk of urinary retention. Among patients with pelvic organ prolapse, numerous risk factors, including the patient's age, genital hiatus size, stage of prolapse, and Levator Ani tone, have been identified as correlated with early post-operative voiding disorders [1]. In this study, we found Stages 1 & 2: 40% of patients with this stage had POUR, while only 3.33% in the "POUR absent" group had this stage. However, the p-value (0.0413) suggests marginal statistical significance. According to the study conducted by Shafik et al. [8] the foremost independent predictors of urinary retention are diminished strength in levator contraction and heightened pre-operative post-void residual urine volume. In our study, the p-value obtained was 0.219. Among the patients who experienced postoperative urinary retention, four individuals (80%) were categorized as having a levator ani tone of 3. However, the clinical prediction of levator ani as an indicator for early postoperative urinary retention did not achieve statistical significance.

Bladder catheterization serves as the established treatment for postoperative urinary retention. This procedure involves either prolonged catheterization or clean intermittent catheterization until a normal voiding pattern is re-established. It is during this timeframe that patients often encounter disappointment and frustration due to discomfort and limited mobility [10]. The clinician's perception of the condition and their vigilance in diagnosing it are pivotal in ensuring successful care for patients undergoing surgical repair. Accurate prediction of early voiding dysfunction allows for appropriate preoperative patient counseling [1]. Urinary retention poses a frequent challenge following surgery, resulting in pain, anxiety, increased costs, and prolonged hospital stays for many patients [14]. Urinary retention is characterized by the inability to void despite having a full bladder [12,15]. It commonly manifests as postoperative bladder overdistension and may lead to permanent detrusor damage. Detrusor damage can result in bladder motility issues and atony, rendering the bladder incapable of contracting and emptying [5]. Bladder distension contributes to 44% of complications, representing a significant aspect of postoperative urinary retention [12]. As the bladder undergoes

distension, bladder atonia ensues, leading to urinary retention and the potential for urinary tract infections. Both human and animal studies have indicated that acute over-distension can induce structural and functional abnormalities in the bladder, occurring within a short timeframe, sometimes as brief as 4 hours, primarily due to bladder ischemia [12]. Persistent urinary retention can exacerbate bladder storage dysfunction by reducing bladder capacity and causing sensations of incomplete voiding. Consequently, this can lead to increased micturition frequency, urinary urgency, and overflow incontinence [12]. Baldini et al. demonstrated a direct correlation between postoperative bladder volume and the risk of persistent urinary retention [12]. General anesthetic agents disrupt the autonomic nervous system, leading to bladder atony. Following the intrathecal injection of local anesthetics, the sensation of urgency to void typically diminishes

within 30–60 seconds [12]. A prospective study conducted in 2005 identified prolonged anesthesia time as an independent risk factor for postoperative urinary retention [16]. Among patients who experienced postoperative urinary retention, four individuals (80%) received spinal anesthesia. However, in this study, the association was not statistically significant at the five percent level, with a p-value exceeding 0.814.

Conclusion

This study concluded that the incidence of early postoperative urinary retention after pelvic reconstruction surgery was 14.29%. Covert retention was observed in 60% of the patients, while overt retention was observed in 40%. None of the variables, including the stage of prolapse, age, body mass index, menopausal status, size of genital hiatus, tone of levator ani muscle, preoperative post-void residue, type of anesthesia, type, and technique of surgery, operation time, or intraoperative blood loss, were found to be statistically significant predictors of early postoperative urinary retention. Patients diagnosed with stage 3 pelvic organ prolapse exhibited a lower risk of postoperative urinary retention than those with stage 1 and 2 pelvic organ prolapse. These differences were statistically significant. Clinicians' understanding of the condition and alertness in its diagnosis are crucial for ensuring successful care for patients undergoing surgical repair. Accurate prediction of early voiding dysfunction allows for appropriate preoperative counseling, and preventive actions could be beneficial for patients.

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