

## Case Report

# Prolonged postoperative urinary retention following spinal anesthesia for knee arthroscopy – a case report

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### Abstract

Postoperative urinary retention (POUR) is one of the most common complications of spinal anesthesia. Although common, prolonged cases of POUR that were associated with spinal anesthesia are sporadic. This article represents a case report of a patient who suffered from prolonged POUR attributed to the spinal anesthesia for knee arthroscopy which was assumed to be caused by intrathecal bupivacaine neurotoxicity. It reports an unexpectedly long duration of POUR that has not been recovered after 14 months, with no additional complications. According to our knowledge, no case of permanent POUR after spinal anesthesia has been reported nor has it been mentioned as a complication of intrathecal bupivacaine administration so far. Therefore, we emphasize the importance of awareness of unexpected complications after medical procedures because it is the provider’s responsibility to recognize them and treat them accordingly.

**Keywords:** urinary retention; spinal anesthesia; bupivacaine; postoperative complication

## 1 Introduction

Postoperative urinary retention (POUR) refers to impaired voiding after surgery despite having a full bladder with an elevation in the volume of retained urine (1,2). If not properly diagnosed, POUR can lead to many complications such as urinary tract infection, bladder overdistension with myogenic changes to the bladder, or autonomic dysregulation which can result in increased morbidity and longer hospital stays (3). Among many perioperative risk factors, POUR has been documented as a complication of spinal anesthesia, possibly as a result of neurological injury. The possible etiologies of neurological injuries include compression of the spinal cord with hematoma, needle-induced trauma, infection, or neurotoxicity of the administered local anesthetic (4).

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Received September 22, 2025, accepted November 4, 2025



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Along with hemodynamic instability, POUR is one of the most common complications of spinal anesthesia (5). Although a common complication, cases of prolonged POUR that were associated with spinal anesthesia are sporadic. The longest duration that was described in the literature was up to 2 weeks (6,7). We present a case report of a patient who suffered from POUR attributed to spinal anesthesia for knee arthroscopy and has not been recovered after 14 months despite comprehensive diagnosis and treatment.

## 2 Case Presentation

A 45-year-old female, 160 cm tall and weighing 75 kg, ASA I status, was hospitalized for the elective arthroscopic reconstruction of the anterior cruciate ligament of the right knee. Her past medical history revealed laparoscopic appendectomy and carpal tunnel surgery. She declared no complications following general and local anesthesia. She did not take any medication and denied any allergies to medication. There were no abnormalities in the physical examination. All the laboratory tests were within normal range. There was no contraindication for performing spinal anesthesia.

After preoperative preparation and premedication with 7.5 mg of midazolam perorally, spinal anesthesia was performed in the sitting position, and 15 mg of bupivacaine was administered using a Quincke needle 26 G, at L3-L4 level, with no difficulties or complications. Intraoperatively, she received 1000 ml of crystalloids. The surgical procedure lasted 120 minutes and went smoothly without any adverse events. The motor block reversed a few hours later and there was no pain except for the pain induced by the procedure. Peroral 1 mg of paracetamol and 600 mg of ibuprofen ensured satisfactory postoperative pain control.

Eight hours after the surgery, she complained of the difficulty of voiding. Physical examination revealed no motor or sensory deficit under the level of spinal anesthesia. Initial management of the urinary retention included intermittent catheterization. Since she was not able to void spontaneously in the next five days, she was examined by a gynecologist, neurologist, and urologist. Magnetic resonance of the lumbosacral spine was performed.

The gynecological examination did not establish a possible reason for urinary retention. The neurological status was normal, with no loss of sensation or motor function, with symmetrically maintained reflexes. Magnetic resonance imaging of the lumbosacral spine ruled out compression of the S2-S4 roots and showed intact conus medullaris. Urological orientation transabdominal ultrasonographic examination showed no signs of obstruction, the kidneys had a normal appearance. After an attempt of spontaneous micturition, 150 ml of residual urine was measured by the ultrasonographic assessment. The urinary culture was sterile. An indwelling catheter was placed.

On the sixteenth postoperative day, the patient was discharged home with a recommendation to use the plug on the urinary catheter during the day and urinary bag during the night. An outpatient urology consultation was scheduled 7 days later. Considering persistence of symptoms, further diagnostic tests were performed. Laboratory values of HbA1c, folic acid, vitamin B12, thyroid-stimulating hormone (TSH), thyroxine (T4), urea, creatinine and electrolytes were within

normal range.

Urodynamic studies were performed in order to determine the etiology of voiding dysfunction. Pressure-flow studies showed reduction of cystometric bladder capacity with an increased proprioceptive sensation. There was a presence of detrusor overactivity (DO), uninhibited contractions followed by urine leakage and complete urination. No signs of obstruction and retention were present. Bladder contractility was normal. In a view with this finding, and along the anamnestic data about complete urinary retention, a neurologist was consulted. Nerve conduction studies showed chronic bilateral S1 radiculopathy. Multiple sclerosis and other suprasacral lesions were ruled out with magnetic resonance imaging.

After the discharge from the hospital, the patient had an indwelling catheter, and she underwent several antibiotic treatments due to urinary tract infections. Even though she was educated, she refused clean intermittent catheterization because of fear and discomfort. She was initially prescribed 0.4 mg tamsulosin hydrochloride once daily. Later, she was treated with 6 mg solifenacin succinate and 0.4 mg tamsulosin hydrochloride in a fixed dose combination of tablets. Solifenacin succinate was initiated due to urodynamic signs of an overactive bladder. During the 14-month follow-up, despite the therapy, there was no improvement in symptoms. Numerous attempts to remove the catheter were unsuccessful. Written informed consent for publication of this case was obtained from the patient.

### 3 Discussion

In order for micturition to occur, after the filling stage and sympathetic inhibition of detrusor contraction via hypogastric nerves (Th10-L1), the detrusor muscle must contract, and external sphincter must relax. Detrusor contraction and relaxation of the urethral smooth muscle occurs after activation of the parasympathetic pelvic nerve (S2-S4). At the same time, the somatic nervous system relaxes the external urethral sphincter via the somatic pudendal nerve (S2-S4) (8,9). Local anesthetics in spinal anesthesia cause denervation of the bladder for a transient period and result in detrusor dysfunction, thus impairing micturition. Its recovery depends on the duration of the sensory block above S2-S3 segments and it usually lasts longer than motor blockade.

Previous studies suggest that time to return to normal varies widely and is mainly correlated with the dose and potency of the intrathecal local anesthetic. According to the studies, following application of intrathecal bupivacaine, urinary function is expected to return to normal after 7-8 hours (2,10). Although older physiologic studies suggest micturition returns within ~7-8 h after intrathecal local anaesthetic, more recent narrative reviews show wide variation in recovery times, and report incidence of POUR ranging from ~5% to over 70% depending on surgical/anesthetic context (2,10,11).

When discussing risk factors for developing POUR, aside from anesthetic technique, there are also surgery-related factors, such as type of surgery (anorectal, gynecologic, laparoscopic surgery), duration of the surgery longer than 2 hours or excessive intravenous fluid administration

(8). Additionally, advanced age, preexisting neurologic disorders like stroke, multiple sclerosis and neuropathy, or preoperative urinary tract pathology increase the risk of POUR (12). Also, postoperative pain management with opioids is another risk factor (13). Our patient had none of them. However, newer data show that neuraxial/spinal anesthesia per se and the use of long-acting intrathecal local anesthetics remain independent risk factors (14).

Among possible causes of POUR, obstruction was ruled out with transabdominal ultrasonographic examination. Urodynamic studies ruled out poor bladder action. Gynecological causes were ruled out by a gynecological examination, neurological injury of the spinal cord and cauda equina, multiple sclerosis, and suprasacral lesions were ruled by a magnetic resonance imaging of the lumbosacral spine. Therefore, we assume that the main cause of POUR in our case could be bupivacaine neurotoxicity.

In our case, the patient reported an inability to void despite the cessation of spinal anesthesia. Our initial goal was to decompress the bladder to avoid long-term damage. Therefore, clean intermittent catheterization was performed. According to the literature, even a single episode of bladder overdistension can reduce contractile function of detrusor muscle because of collagen deposition between the smooth muscle fibers and lead to chronic impairment of bladder emptying and atony, but it is unlikely, with bladder overdistension that lasts no longer than 4 hours (13,15).

There is some controversy in the literature regarding the time and type of catheterization. The role of ultrasonographic assessment of bladder and residual volume in the bladder for the diagnosis of POUR has been well established, but there is still no consensus for the criteria for determining the timing of catheterization (11). Bladder volumes ranging from 300–600 ml are mostly used as a cut-off values for the catheterization (12). Other authors recommend catheterization if a post-void residual volume is 150 ml or more (16).

Urethral catheterization can be done either by placing indwelling catheter or by intermittent in-and-out catheterization, but it remains unclear what the most appropriate approach is. Indwelling catheters increase the risk of developing urinary tract infections and can be a significant discomfort to the patient, but prevent possible overdistension of the bladder. On the other hand, intermittent catheterization carries a low risk of urinary tract infection but can result in overdistension of the bladder (9,12). The first choice for our patient was intermittent catheterization because we expected her voiding problems to return to normal in a short period and we wanted to avoid urinary tract infection. However, due to the prolongation of POUR, and after urological assessment, an indwelling catheter was placed and the patient was discharged home.

With the indwelling catheter, our patient suffered from many urinary tract infections and she underwent numerous antibiotic treatments. For this reason, clean intermittent catheterization was recommended to her and she was educated about the procedure. Despite all the potential benefits of clean intermittent catheterization in her case, she refused it because of pain, discomfort, and fear.

Tamsulosin is a selective alpha-blocker primarily used to treat lower urinary tract symptoms secondary to benign prostate hyperplasia (17). Its off-label use was found to be an effective treatment for acute postoperative urinary retention. Studies indicate that initiating alpha-blocker

therapy prior to a trial without catheter (TWOC) can approximately double the likelihood of successful spontaneous voiding and decrease the necessity for re-catheterization (8,18). It is therefore recommended to start that therapy a few days before the TWOC in all the patients who do not have any contraindications.

Some meta-analyses indicate that perioperative prophylactic tamsulosin can reduce the incidence of POUR (17,19). However, recent randomized controlled trial evaluated whether prophylactic use of an alpha-1 blocker reduces the rate of postoperative urinary retention after transanal endoscopic microsurgery and that study have failed to confirm a statistically significant benefit (20). Our patient was prescribed tamsulosin after POUR, but despite the therapy, all the attempts to void after catheter removal were unsuccessful. She did not receive any alpha-blocker during the perioperative period because no risk factors were present at that time.

Solifenacin succinate is an antimuscarinic agent that is considered to be the first-line therapy for detrusor overactivity (21). The basic idea for the introduction of the combination of solifenacin succinate and tamsulosin to our patient was that the antimuscarinic component reduces detrusor overactivity, and tamsulosin facilitates voiding. Even after the combination therapy, there was no regression of symptoms.

According to our knowledge, there are few if any published cases of persistent (> weeks to months) urinary retention following spinal anesthesia with bupivacaine after exhaustive diagnostic exclusion. Taking into consideration that many potential causes of POUR have been ruled out with extensive diagnostic, it could be that POUR in our patient is a rare side effect of bupivacaine. This case therefore raises the possibility of a rare complication, but does not establish causation. In accordance with pharmacovigilance regulations, this suspected adverse reaction has been reported to the national competent authorities responsible for monitoring drug-related adverse events. We encourage clinicians to remain vigilant and further research is needed.

Limitations of our inference include absence of baseline urodynamic or neurologic bladder assessment pre-operatively, inability to definitively exclude subclinical neuropathy pre-surgery, and the fact that causal attribution of persistent retention to intrathecal bupivacaine remains theoretical. In addition, the heterogeneous bladder scanning protocols and varying definitions of POUR across the literature complicate direct comparisons (11).

Considering all the above, we would like to emphasize that anesthesiologists should be aware of the potential neurotoxicity of local anesthetics. It is every provider's responsibility to recognize expected and unexpected complications after any medical procedure and treat them promptly.

## Acknowledgments

The authors have no acknowledgements to declare.

## Ethics Statement

Written informed consent was obtained from the patient.

## Funding Statement

This case report received no external funding.

## Conflict of Interest

The authors declare that they have no conflicts of interest.

## Author Contributions

**M.C.** collected the clinical data and wrote the manuscript, **T.M.T.** provided clinical care for the patient and supervised the work, **A.Š.** reviewed the literature and critically revised the manuscript for the intellectual content, **G.J.** provided clinical care for the patient. All authors read and approved the final manuscript.

## Data Availability

Data sharing is not applicable to this article as no datasets were generated or analyzed.

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