

Urinary Retention in Pregnancy: A Case Report and Literature Review (Post-Print)

Authors: Nan Ziqing, Lin Li, Lin Li

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Abstract

Urinary retention is common in elderly males but rare in females. Although the incidence of urinary retention during pregnancy is low, it can lead to serious complications and adverse pregnancy outcomes, making early clinical recognition and management critically important. Timely symptomatic and etiological treatment is essential to prevent adverse outcomes. This article reviews the etiology, diagnosis, and treatment of urinary retention during pregnancy based on domestic and international literature, while also retrospectively analyzing 2 cases of pregnant patients with urinary retention admitted to Peking University International Hospital between January 2021 and January 2022, combined with 19 reported cases from domestic and international sources. We summarize and analyze their pathogenesis, diagnostic and therapeutic course, and prognosis to provide clinical physicians with diagnostic and therapeutic insights and evidence.

Full Text

Progress in the Diagnosis and Treatment of Urinary Retention During Pregnancy—With 2 Case Reports

Nan Zi-qing, Lin Li*

Department of Gynecology and Obstetrics, Peking University International Hospital, Beijing 102206, China

*Corresponding author: LIN Li, Professor, Doctoral supervisor; E-mail: linli488@aliyun.com

Abstract

Urinary retention is common in elderly men but rare in women. Urinary retention during pregnancy has a low incidence but can cause serious complications

and adverse pregnancy outcomes, making early identification and management clinically crucial. Only through timely symptomatic and etiological treatment can adverse outcomes be avoided. This article reviews the etiology, diagnosis, and treatment of urinary retention during pregnancy based on domestic and international literature. Additionally, we retrospectively analyzed two patients with urinary retention during pregnancy admitted to Peking University International Hospital from January 2021 to January 2022, and combined these with data from 19 reported cases at home and abroad to summarize and analyze their pathogenesis, diagnosis and treatment processes, and prognosis, aiming to provide clinical physicians with diagnostic and therapeutic insights and references.

Keywords: Pregnancy; Urinary retention; Diagnosis and management; Review

Urinary retention refers to the inability to empty a full bladder, often developing from progressive urinary difficulty. While common in elderly men, urinary retention is rare in women, and its incidence during pregnancy is particularly low. However, it can lead to severe complications such as recurrent urinary tract infections, acute renal failure, bladder rupture, miscarriage, and uterine rupture [1-3], endangering both maternal and fetal safety. Therefore, early recognition and management are essential. This article combines reported cases of urinary retention during pregnancy from domestic and international literature with two cases from our institution to summarize and analyze the etiology, pathological characteristics, diagnosis, and treatment, aiming to improve clinical capacity for early diagnosis and management.

1 Epidemiology

Urinary retention is rare in women, with an incidence of 0.07‰ [4]. The incidence of urinary retention during pregnancy is 4.7‰ [5]. Most current literature consists of case reports, with only one large retrospective cohort study available. In case reports, the reported gestational age at onset ranges from 6 to 23 weeks, with the majority occurring between 10 and 18 weeks. A retrospective cohort study from Taiwan [5] investigated the epidemiology and risk factors of urinary retention during pregnancy, including 65,490 pregnancy cases between January 1, 1998, and December 31, 2011, and identified 308 cases of urinary retention during pregnancy. The peak incidence occurred at 9-16 weeks of gestation, which was twice that of other gestational periods. Other pathological features included: acute urinary retention increased with maternal age, with risk significantly higher in patients >35 years compared to those <20 years (OR = 2.62). The risks for preterm, term, and post-term pregnancies were 2.18%, 0.33%, and 0.46%, respectively, with preterm pregnancy significantly associated with acute urinary retention (OR = 6.33).

2 Etiology

2.1 Pregnancy-Related Factors

Whether pregnancy itself causes urinary retention remains inconclusive, but physiological changes in the urinary system during pregnancy are associated with its occurrence. During pregnancy, glomerular filtration rate increases, leading to greater urine output. Under the influence of progesterone, smooth muscle relaxation and decreased ureteral peristalsis cause mild dilation of the renal pelvis and ureters. In the second and third trimesters, as the uterus enlarges, the bladder ascends and the bladder trigone elevates, potentially obstructing urine flow and exacerbating ureteral dilation. The enlarged uterus or presenting part descending into the pelvis crowds the pelvic space, reduces bladder capacity, and causes urinary frequency [6].

2.2 Uterine Factors

The most common cause of urinary retention during pregnancy is incarceration of the gravid uterus. Retroverted uterus is not uncommon, occurring in 15% of early pregnancies, with most spontaneously correcting before 14 weeks. When the uterus becomes trapped in the sacral hollow of the pelvic cavity and cannot ascend into the abdominal cavity, it is termed incarcerated gravid uterus, with an incidence of 1/3,000 [7]. Risk factors for incarcerated gravid uterus include endometriosis, adenomyosis, posterior uterine wall fibroids, and pelvic adhesions [3, 8]. Among cases of incarcerated gravid uterus, 53.7% develop urinary symptoms, including urinary retention, frequency, urgency, and incontinence [9]. Urinary retention in a previous pregnancy may recur in subsequent pregnancies [10]. Yang et al. [11] used ultrasound to observe urinary tract changes caused by uterine fibroids in non-pregnant women and retroverted uterus in pregnancy, revealing the mechanism by which pelvic masses cause urinary retention. Ultrasound showed that in the supine position, fibroids caused upward and forward displacement of the cervix, compressing the lower bladder and obstructing the internal urethral orifice without compressing or narrowing the urethra itself. In pregnant women with retroverted uterus performing Valsalva maneuver in supine position, urethral mobility was unrestricted, and the bladder neck descended vertically or rotationally. With increased abdominal pressure, compression of the lower bladder became more pronounced, completely covering the internal urethral orifice. In the standing position, urine accumulated in the lower bladder while the bladder neck descended further. Daytime bladder compression caused urinary frequency; frequent urination prevented bladder overdistension. In standing position, urine accumulated in the lower bladder, preventing urethral orifice compression. In supine position, the upper bladder drooped, and urine accumulated in the upper bladder by gravity, causing collapse of the lower bladder and compression of the urethral orifice, exacerbated by uterine pressure on the bladder, particularly with excessive fluid intake.

2.3 Other Factors

Less common causes include uterine prolapse, cervical pregnancy, bladder tumors, meningiomas, Gartner's duct cysts, and bladder diverticula [2, 12-15]. Analysis of these rare causes can be categorized as follows: obstructive, such as abnormal bladder position or urethral obstruction; neurological, such as cauda equina or spinal cord injury; and abnormal periurethral muscle contraction, such as Fowler's syndrome.

3 Clinical Features and Diagnosis

Clinical manifestations of urinary retention during pregnancy are diverse, primarily urinary symptoms. The most common is difficulty urinating, followed by frequency and incomplete emptying. Secondary symptoms include lower abdominal distension and pain, accompanied by other manifestations such as vaginal bleeding, back pain, perineal edema, and constipation. In early pregnancy, vaginal bleeding with abnormal gestational sac location should raise suspicion for cervical pregnancy when urinary retention occurs [12]. Based on literature analysis, when incarcerated gravid uterus is present, speculum examination may reveal a markedly elevated cervix that is difficult to visualize, bimanual examination may detect an extremely retroverted uterus compressing the rectum, fundal height may be lower than expected for gestational age, and fetal heart tones may be difficult to auscultate.

Urinary retention is defined as the inability to void voluntarily. There is no standard definition for residual urine volume. Normal bladder capacity is 400-600 ml, with overdistension defined as capacity >600 ml [16]. Generally, residual urine >100-150 ml is considered urinary retention requiring intermittent catheterization.

4 Diagnostic Methods

4.1.1 Ultrasound Examination

Ultrasound, with its reproducibility and non-invasive nature, can effectively evaluate bladder status, renal morphology, and lower urinary tract anatomical changes, making it the preferred diagnostic method for urinary retention during pregnancy. Transvaginal ultrasound is superior to transabdominal ultrasound in assessing lower urinary tract changes caused by pelvic masses [11]. Ultrasound can also evaluate residual urine volume, guiding the timing of indwelling catheterization and reducing injury from repeated catheterizations. There have been reports of misdiagnosing a urine-filled bladder as a pelvic cyst leading to misdiagnosis. When ultrasound reveals an abdominal cystic mass, clinicians should verify whether a separate bladder image exists and avoid hastily diagnosing a "pelvic mass" to reduce misleading clinical judgment [17].

4.1.2 MRI Examination

MRI offers multi-dimensional imaging and a larger field of view for acute urinary retention occurring in the second and third trimesters, providing superior visualization of contrast between the uterus and surrounding bowel, blood vessels, and bladder tissue [17]. Although few reports describe MRI use, it can be considered when diagnosis remains uncertain. In incarcerated gravid uterus, the fundal placenta may be mistaken for placenta previa, which can be clarified by MRI.

4.1.3 Cystoscopy

Cystoscopy provides direct visualization of bladder and urethral morphology, determining the presence of compressive obstructive lesions and ruling out bladder tumors. It can be considered when diagnosis remains unclear.

4.2 Laboratory Examination

Urinary retention during pregnancy may be complicated by urinary system complications, including acute renal failure and urinary tract infection, though these are uncommon. Laboratory monitoring should focus on renal function and electrolytes, with urinalysis and urine culture to exclude urinary tract infection. In our Case 2 (see Table 1), liver function abnormalities were observed, which normalized after resolution of urinary retention. Although the mechanism remains unclear and no similar reports exist in other literature, this suggests that besides urinary complications, other systemic abnormalities require attention.

5 Management

5.1 Treatment

First-line management involves symptomatic treatment to promptly empty the bladder and relieve symptoms, most commonly through indwelling catheterization. However, prolonged catheterization increases the risk of urinary tract infection. The literature also mentions clean intermittent self-catheterization, though patient compliance is low. Catheterization duration that is too short may lead to early recurrence. Studies have shown that 7 days of indwelling catheterization in pregnant women with urinary retention provides adequate urine drainage, improves clinical effectiveness, and does not increase infection risk compared to 3 days [18]. Second, etiological treatment should be initiated as early as possible. For incarcerated gravid uterus, manual reduction can be performed, with high success rates before 15 weeks. If direct reduction is difficult, reduction under general anesthesia or with colonoscopic assistance may be attempted, or laparoscopic reduction if necessary (e.g., for endometriosis). For fibroid compression, myomectomy may be considered when necessary. Although cases of successful pregnancy to term after antepartum myomectomy have been reported, surgery during pregnancy increases miscarriage risk and

requires careful consideration. For uterine prolapse, a pessary can be inserted. Multidisciplinary consultation should be considered when the etiology remains unclear.

5.2 Prevention

Avoiding prolonged bladder holding and developing good urinary habits during pregnancy are crucial. For women with retroverted uterus, attention should be paid to risk factors for urinary retention before 14 weeks, such as difficulty urinating and abdominal distension or pain; prompt medical attention should be sought once urinary retention occurs. For large uterine fibroids, particularly those in the posterior wall, surgical treatment may be considered before pregnancy. Yang et al. [11] recommend the following measures to prevent urinary retention caused by pelvic masses (such as incarcerated gravid uterus): 1) limit fluid intake before bedtime; 2) change from supine to prone position for a period before getting up to urinate; 3) lean forward when initiating urination; and 4) avoid Valsalva maneuvers and use the Crede method to initiate or maintain urination.

6 Analysis of Literature on Urinary Retention During Pregnancy

We retrospectively analyzed two patients with urinary retention during pregnancy admitted to Peking University International Hospital from January 2021 to January 2022, combined with data from 19 recently reported cases from domestic and international literature, to summarize and analyze their pathogenesis, diagnosis and treatment processes, and prognosis to facilitate clinical learning and reference.

6.1 Summary of Two Cases from Our Hospital

Case 1: A 34-year-old woman, gravida 2 para 1, with last menstrual period on August 22, 2021, presented to the emergency department at 03:53 on November 11, 2021, with “11+4 weeks gestation and difficulty urinating for over 1 hour.” At 5+6 weeks, ultrasound showed an anteverted uterus with anteroposterior diameter of 8.8 cm, multiple uterine fibroids with partial calcification, the largest measuring 4.8×4.9 cm in the left anterior wall exophytic region, increasing to 5.3×5.0 cm at 8+5 weeks. Fibroids were first discovered in 2017 at approximately 5 cm, enlarged to 8 cm during pregnancy in 2018 without causing urinary retention, and reduced to 5 cm postpartum. The patient drank over 100 ml of water before sleep on November 10. At 02:00 on November 11, she experienced lower abdominal distension that awakened her, with inability to void. Physical examination revealed a bladder outline palpable three fingerbreadths above the pubic symphysis with pressure-induced urge to urinate. Ultrasound indicated bladder volume of 282 ml, suggesting acute urinary retention. Indwelling catheterization was performed, draining 600 ml of urine. The patient was dis-

charged with the catheter, instructed to return after 3 days. The following day, she could void spontaneously with the catheter in place, and it was removed. At 01:50 on November 15, 2011, she presented again with “12+1 weeks gestation and difficulty urinating for 4 hours,” with similar symptoms. Catheterization was repeated, initially draining 750 ml. The next day she could void spontaneously; the catheter was retained for 3 days and removed on day 4, after which she could urinate normally. Subsequently, the patient avoided drinking water after 20:00 and voided every 1-1.5 hours before 02:00, with no further urinary retention episodes during pregnancy.

Case 2: A 37-year-old woman, gravida 5 para 2, with last menstrual period on September 17, 2021, presented to the emergency department on December 25, 2021, with “14 weeks gestation and lower abdominal distension for over 4 hours.” Physical examination revealed blood pressure 200/110 mmHg, heart rate 130 beats/min; after 10 minutes, blood pressure was 130/80 mmHg, heart rate 120 beats/min. No medication was administered, and continuous cardiac monitoring was initiated. The abdomen was distended, with a bladder outline palpable three fingerbreadths above the pubic symphysis and obvious urge to urinate upon pressure; no abdominal tenderness, rebound tenderness, or muscle rigidity was present. Fetal heart tones were inaudible. Combined with the patient’s complaint of no urination for over 4 hours, acute urinary retention was suspected. Catheterization was performed, draining 800 ml initially, then clamped for half an hour, then reopened to drain an additional 200 ml, after which the catheter was left open continuously. Post-catheterization blood pressure fluctuated between 130-150/90-105 mmHg, heart rate 100-110 beats/min. Laboratory tests: white blood cells $16.12 \times 10^9/L$, neutrophils 83.8%; liver function: ALT 93 U/L, AST 61 U/L; urinalysis: protein negative, leukocytes positive, WBC count 36/l; urinary ultrasound: mild right pelviectasis, width 0.9 cm, no bilateral ureteral dilation; echocardiography: decreased left ventricular diastolic function. Obstetric history: gravida 5 para 2, delivered a full-term female infant in 2006; delivered a full-term male infant via cesarean section in 2013, with reportedly normal blood pressure during pregnancy and elevated blood pressure after cesarean section (details unknown); had one medical abortion in 2014; had one miscarriage at 22 weeks due to premature rupture of membranes in 2019. Comorbidities included polio with limping but no other abnormalities; no special family history. Admission diagnosis: 14 weeks gestation, G5P2, acute urinary retention, chronic hypertension in pregnancy, abnormal liver function, scarred uterus, sinus tachycardia. After admission, continuous cardiac monitoring and indwelling catheterization were maintained; cefuroxime was administered intravenously for infection prevention; glucurone was given orally for liver protection; hepatology consultation considered that recent urinary difficulty combined with urinary tract infection could cause transient liver function abnormalities, and urine culture was ordered. Liver function rechecked on admission day: ALT 81 U/L, AST 55 U/L, showing a downward trend; OGTT: 5.0-9.5-8.6 mmol/L, indicating GDM, managed with diet and exercise with normal glucose control. The patient was discharged with catheter on December 29, 2021. At discharge,

liver function was normal: ALT 33 U/L, AST 18 U/L; blood count: WBC $10.09 \times 10^9/L$, neutrophils 63.5%; urine culture negative. On December 31, 2021, at outpatient visit after catheter removal, residual urine was 0 ml. Telephone follow-up over 2 months post-discharge revealed no recurrent urinary retention.

6.2 Literature Review

We searched the CNKI and Wanfang databases using the Chinese search term “妊娠期尿潴留” and PubMed using the keywords “urinary retention AND pregnancy” from 2010 to present, identifying 3 Chinese and 8 English case reports. Combined with our 2 cases, a total of 21 cases were analyzed to summarize their clinical characteristics (see Table 1).

Table 1. Clinical Characteristics of 21 Cases

Reference	Gestational Age	Parity	Clinical Complications	Physical Examination/Comorbidities	Auxiliary Examination	Treatment	Recurrence	Pregnancy Outcome
Tupikova et al. [15] 2011	G5P5 12 weeks		Bladder neck fibroid	Abdominal pain, difficulty urinating	Not described	Ultrasound	Myomectomy	Full-term delivery at 36 weeks
Martín et al. [19] 2013	Not specified	13 weeks	Uterine prolapse	Urinary frequency, urgency	Cervical elevation, bladder filling	Ultrasound	Manual uterine reduction, pessary placement	No Cesarean at 36+5 weeks after PROM
Lam et al. [20] 2015	G2P1 14 weeks		Incarcerated uterus, endometriosis	Progressive urinary difficulty	Cervical displacement, vaginal mass	MRI, ultrasound	Catheterization 1800 ml, manual reduction	Full-term delivery at 39 weeks

Reference	Gra	Gravidity	Age	Parity	Gestational Age	Complications	Clinical Manifestations/Comorbidities	Physical Examination	Auxiliary Examination	Treatment	Recurrence	Pregnancy Outcome
Slama et al. [21] 2015	G1P0	15 weeks			Incarcerated uterus	Urinary difficulty, back pain	Bilateral	Ultrasound	Catheterization	Noizat	Full-term delivery at 38 weeks	
Verma et al. [14] 2018	G3P2	16 weeks			Gartner's abscess	Perineal pain, fever	Posterior fornix fullness, anterior cervical displacement	Ultrasound	Catheterization	Noizat	Miscarriage at 7 weeks	
Kim et al. [8] 2018	G2P1	17 weeks			Incarcerated uterus	Urinary difficulty, abdominal pain	Posterior fornix fullness, retroverted uterus with large mass	Ultrasound	Catheterization	Noizat	Delivery at 38 weeks	

Reference	Gestational Age	Parity	Complications	Clinical Manifestations/Comorbidities	Physical Examination	Auxiliary Examination	Treatment	Recurrence	Pregnancy Outcome
Han et al. [9] 2019	G4P2	18 weeks	Adenomyosis suspected incarcerated uterus	Progressive urinary difficulty	Abdominal cystic mass, poor mobility	Ultrasound	Catheterization, manual reduction, pessary (15 weeks)	Noization	Delivery at 40+2 weeks
[17] 2019	G3P1	19 weeks	Posterior wall fibroid, suspected incarcerated uterus	Difficulty urinating, left upper abdominal pain	Bladder filling, uterine incarceration	Ultrasound	Catheterization, manual reduction, pessary failure, vaginal packing	4 days later	Cesarean at 36+6 weeks for severe preeclampsia
[22] 2019	G2P0	20 weeks	Incarcerated uterus	Urinary difficulty, vaginal bleeding	Difficult cervical visualization, uterine fundus in sacral hollow	Ultrasound	Catheterization, manual reduction	Noization	Full-term delivery at 38 weeks

Reference	Gestational Age	Parity	Complications	Clinical Manifestations/Comorbidities	Physical Examination	Auxiliary Examination	Treatment	Recurrence	Pregnancy Outcome
[23] 2021	G5P2	21 weeks	Incarcerated uterus	Abdominal pain, intermittent urinary retention	Bladder bot-tom at umbilicus, tender	Ultrasound	Catheterization 550 ml, manual reduction	No	Full-term delivery at 38 weeks
Zhuang et al. [1] 2021	G4P1	22 weeks	Incarcerated uterus	Abdominal distension, lower abdominal pain, fatigue	Difficult cervical exposure, retroverted uterus	Ultrasound	Catheterization 680 ml, manual reduction	No	Full-term delivery at 38 weeks
Our Case 1	G2P1	11+4 weeks	Multiple fibroids	Difficulty urinating	Bladder outline palpable	Ultrasound	Catheterization 600 ml, then 750 ml	Yes, 4 days later	Non-ful-ther episodes, delivered at 39+ weeks
Our Case 2	G5P2	14 weeks	Chronic hypertension, liver dysfunction, polio	Lower abdominal distension	Bladder outline palpable, blood pressure 200/110 mmHg	Ultrasound MRI	Catheterization 800 ml, continuous drainage	No	Non-recurrence, ongoing pregnancy

6.3 Summary of Clinical Characteristics

Analysis of these cases revealed the following characteristics: 1) Age at onset ranged from 22 to 42 years (mean 31.6 years), with 33.3% (7/21) aged \$ \$35

years; 33.3% (7/21) were nulliparous and 66.7% (14/21) were multiparous, with multiparity being more common. Gestational age at onset ranged from 6 to 23 weeks, with 10 cases in early pregnancy and 11 in mid-pregnancy; 81.0% (17/21) occurred at 10–18 weeks, predominantly in early to mid-pregnancy. 2) The most common cause was incarcerated gravid uterus (42.9%, 9/21), resulting from adenomyosis, posterior uterine wall fibroids, uterine prolapse, and retroverted uterus. Other causes included bladder neck leiomyoma and Gartner's abscess. 3) Clinical manifestations were primarily urinary symptoms, present in 19 of 21 cases, with 89.5% (17/19) showing difficulty urinating; other symptoms included frequency, incomplete emptying, abdominal distension, pain, vaginal bleeding, vulvar swelling, perineal pain, fever, fatigue, constipation, back pain, left upper abdominal pain, and nausea. The main physical finding was palpation of a distended bladder in the lower abdomen. 4) Abdominal ultrasound was the primary auxiliary examination method, including 11 urinary system ultrasounds and 10 obstetric ultrasounds. 5) Catheterization to relieve urinary retention was the main symptomatic treatment, followed by etiological treatment. Among 21 cases, 9 had indwelling catheters for 1–10 days, with recurrence in 3 cases—2 after 1 day of catheterization (recurrence on days 3 and 5) and 1 after 1 week (requiring another week of catheterization). Eleven cases had immediate catheterization, with recurrence in 1 case. Etiological treatment and adequate catheterization duration were important measures to prevent recurrence. 6) Complications and pregnancy outcomes: acute renal failure, urinary tract infection, and liver dysfunction each occurred in 1 case. There were 3 preterm deliveries and 2 spontaneous abortions; other outcomes were favorable.

In summary, urinary retention during pregnancy has a low incidence, occurring predominantly in women aged 22–42 years (mean 31.6 years), more commonly in multiparous women, and mainly in early to mid-pregnancy. Incarcerated gravid uterus from various causes is the most common etiology. The main clinical symptom is difficulty urinating, with a distended bladder palpable in the lower abdomen as the primary sign. Abdominal ultrasound is the main diagnostic tool and sufficient for clinical needs. Catheterization is the primary symptomatic treatment, while etiological treatment and adequate catheterization duration are important to prevent recurrence. Patient education about avoiding prolonged bladder holding and developing good voiding habits during high-risk gestational periods is crucial for prevention. In conclusion, urinary retention during pregnancy can cause serious complications including acute renal failure, urinary tract infection, and miscarriage. Early diagnosis and management are critical and warrant clinical attention to ensure timely symptomatic and etiological treatment, avoid adverse outcomes, and ensure maternal and fetal safety.

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