

CASE REPORT

# Urinary System Spontaneous Rupture – an Urological Emergency

Dragos Marcu<sup>1</sup>, Ovidiu Bratu<sup>1,2</sup>, Dan Spinu<sup>1,2</sup>, Robert Popescu<sup>1</sup>, Agnes Ciuca<sup>1</sup>, Maria Galaman<sup>3</sup>, Ioana Oprea<sup>4</sup>, Dan Mischianu<sup>1,2</sup>

## Abstract

**Introduction:** Spontaneous rupture of the urinary collecting system is a rare urologic pathology, which involves the existence of an obstacle that causes urinary stasis with increasing retrograde pressure, that may lead to the appearance of a breach upstream the obstacle with extravasation of urine into the retroperitoneal space. There are many pathologies that can cause spontaneous rupture of the urinary collecting system, but the most common cause cited in urologic literature is represented by urinary lithiasis obstruction. Perforation can occur at any level of the urinary collecting system, but it is more frequently seen at the level of the renal pelvis and upper ureter. Due to the severity of its possible complications (urinoma, retroperitoneal abscess formation and sepsis) adequate treatment should be instituted as soon as possible. **Materials and methods:** We present two cases of spontaneous rupture of the urinary collecting system, cases in which the endourological procedures have failed and the viable solution was open surgery. The first case is a 47 years old man, who was diagnosed with spontaneous rupture of the left superior lumbar ureter and retroperitoneal urinoma after transurethral resection of a small bladder tumor. The second case is a 46 years old female with lithiasic history who was diagnosed with spontaneous rupture of the left renal pelvis and left uroretroperitoneum, probably secondary to a temporary obstructive urinary stone (the imaging investigations that have been performed haven't revealed the presence of any obstructive urinary stones).

**Conclusions:** Spontaneous rupture of the urinary collecting system is an urological emergency due to the severity of its complications. The imaging investigations have an essential role in establishing the diagnosis, because the symptoms can mimic many other abdominal pathologies and even an experienced physician can be misled. The first line treatment is represented by minimally invasive endoscopic procedures which offer excellent results and fewer complications than open surgery, but when endourology fails, classic surgery remains the solution.

## Abstract

**Introducere:** Ruptura spontană de căi urinare este o urgență urologică, care presupune existența unui obstacol la nivelul căilor urinare, ce determină stază urinară și creșterea retrogradă a presiunii, cu apariția spontană a unei breșe la nivelul căilor urinare. Apariția efracției poate duce la apariția uroretroperitoneului și la complicații redutabile. Există numeroase patologii care pot determina apariția unei rupturi spontane de căi urinare, dar cea mai frecventă cauză este litiaza urinară. Ținând cont de gravitatea posibilelor complicații tratamentul trebuie inițiat cât mai rapid.

**Material și metoda:** Prezentăm două cazuri de ruptură spontană de căi urinare, în care intervențiile endourologice au eșuat, deși acestea au fost de prima intenție. Soluția viabilă a fost chirurgia clasică. În primul caz cauza efracției a fost cel mai probabil prin obstrucție litiazică temporară, deși la examinarea CT nu s-au vizualizat calculi urinari obstructivi, iar în cazul celui de-al doilea pacient ruptura s-a produs în urma rezecției endoscopice a unei formațiuni

<sup>1</sup> Clinic of Urology, „Dr. Carol Davila” Emergency University Central Military Hospital, Bucharest, Romania

<sup>2</sup> Clinical Department 3, „Carol Davila” University of Medicine and Pharmacy, Bucharest, Romania

<sup>3</sup> Clinic of Radiology, „Dr. Carol Davila” Emergency University Central Military Hospital, Bucharest, Romania

<sup>4</sup> Department of Anesthesiology and Intensive Care, „Dr. Carol Davila” Emergency University Central Military Hospital, Bucharest, Romania

### Corresponding author:

**Agnes Ciuca**

Clinical Department 3, „Carol Davila” University of Medicine and Pharmacy, Bucharest, Romania

tumorale vezicale. În ambele situații investigațiile imagistice au fost cele care au stabilit diagnosticul. **Rezultate și concluzii:** Ruptura spontană de căi urinare este o patologie care impune tratament adecvat în regim de urgență. Investigațiilor imagistice au un rol esențial în stabilirea diagnosticului de certitudine. Atunci când tehnicile endourologice eșuează, abordul deschis rămâne soluția salvatoare.

**Cuvinte cheie:** ruptura de căi urinare, urgență, chirurgie deschisă, abdomen acut

## INTRODUCTION

Spontaneous rupture of the urinary collecting system is a rare urologic pathology, but due to the severity of its possible complications, it represents an urological emergency which requires adequate urgent treatment.

According to the literature, the most frequent cause of spontaneous urinary collecting system rupture is represented by obstructive urinary lithiasis, which can cause urinary stasis with retrograde increasing pressure, that may lead to the appearance of a breach upstream the obstacle with extravasation of urine in the retroperitoneal space.

Perforation can occur at any level of the urinary collecting system, but it occurs more often at the level of the renal pelvis and upper ureter<sup>1</sup>.

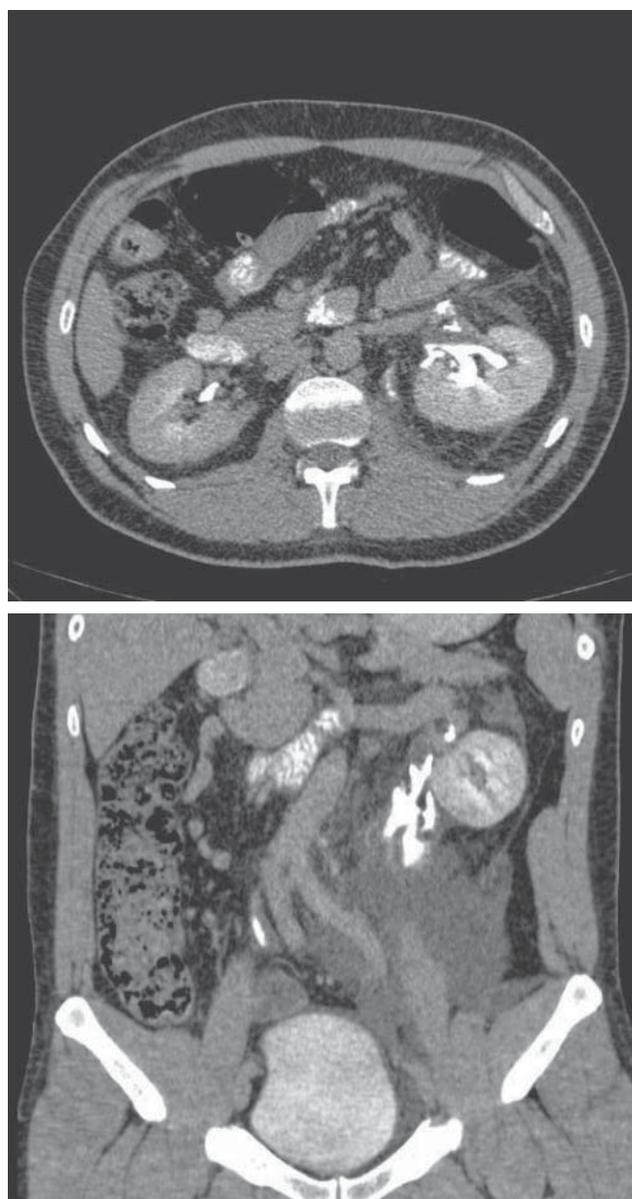
There are many other pathologies that determine direct or indirect obstruction which may lead to the spontaneous rupture of the urinary collecting system such as: abdominal and pelvic masses which may have a compressive effect (colon, rectal, ovarian, cervical neoplasia, pelvic swollen lymph nodes, as well as other tumors involving the abdomen and pelvis, pelvic abscess), obstructive causes (benign or malignant prostatic hyperplasia, bladder tumors, ureteral tumors, urethral tumors, urethral valves), iatrogenic causes (ureteric injury after gynecological surgery such as surgical ligation of the ureter after hysterectomy, ureteric orifice obstruction by the Foley catheter balloon or after radical prostatectomy, as a complication after extracorporeal shock wave lithotripsy, after ureteroscopy, radiotherapy), retroperitoneal fibrosis, pregnancy, pielo-ureteric junction syndrome, trauma (blunt or penetrating), neurogenic bladder with secondary urinary retention<sup>1-4</sup>.

## MATERIALS AND METHODS

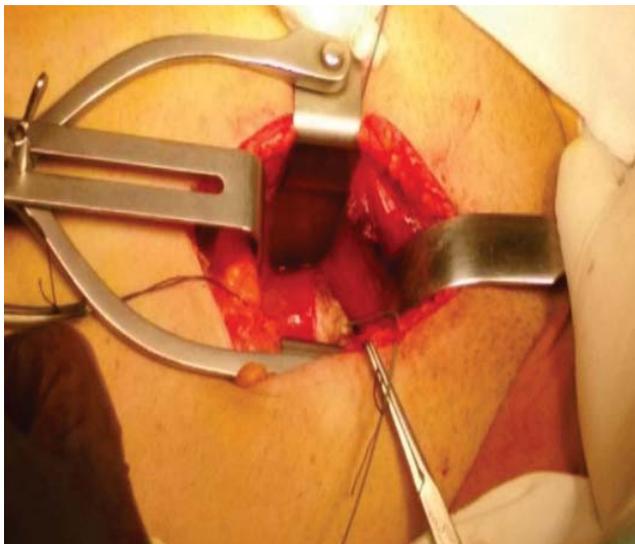
We present the management of two such cases in which the rupture was secondary to a transurethral bladder tumor resection (first case) and possible secondary to temporary obstructive urinary lithiasis (second case – despite the imaging investigations did not reveal any obstructive urinary stones, although the patient was known for its lithiasic history).

## Case 1

A 47 year-old patient was admitted in our clinic for ultrasound suspicion of a bladder tumor. During the last month the patient has lost in weight approximately 10 kg. An ultrasound abdominal examination was conducted and raised the suspicion of a bladder tumor,



**Figure 1, 2.** Show delayed contrast CT phase with extravasation of the contrast substance; from the upper lumbar left ureter to the retroperitoneal space, with extension towards the pelvis.



**Figure 3.** Trasvesical catheterisation of the left ureteral orifice with a ureteral guide.



**Figure 4.** Left retroperitoneal, left paravesical and Retzius drainage tubes.

located on the left lateral wall of the bladder, measuring about 1/1cm in diameter.

Anamnesis revealed that he was a smoker (a pack of cigarettes a day for 25 years), and his surgical history included only an appendectomy 30 years ago.

Clinical examination was within normal limits and his vital signs at the time of admission were as follows: blood pressure-127/75 mmHg, pulse-58 beats per minute and regular, respiratory rate- 17 respirations per minute and body temperature - 36.4°C.

Biochemical analysis revealed no significant changes, except leukocytosis whose value was 11.4 k / microl. Urinalysis showed microscopic hematuria, the number

of red cells per field being 2 to 5 and 0 to 3 white cells per field under high-power magnification. The patient didn't accuse macroscopic hematuria.

The following day, after a proper preoperative preparation, cystoscopy was performed under spinal anesthesia. We have visualized a small bladder tumor, located on the left side wall of the bladder, on the upper edge of the left ureteral orifice. We have practiced transurethral resection of the bladder tumor and hemostasis, and we have sent the fragments which have resulted from the resection to histopathological examination. A one way bladder Foley catheter was placed and it was suppressed on the morning of the second day after the operation.

The postoperative evolution was marked by the sudden appearance of left flank pain which radiated to the lower abdomen, accompanied by nausea, sweat and chills, symptoms which appeared on the second day after the operation, at 3 hours after the bladder catheter was removed.

Abdominal ultrasonography was performed and it revealed perinephric fluid collection which extended towards the inferior and anterior abdominal wall. No intraperitoneal fluid collection was seen, as well as any hydronephrosis.

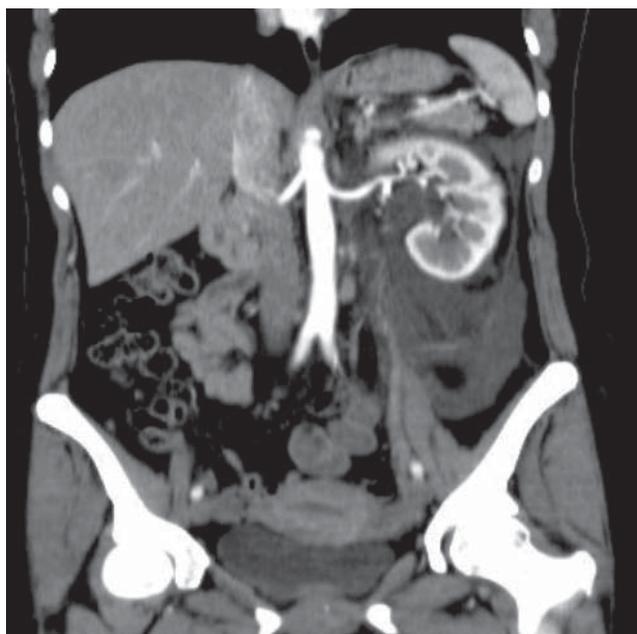
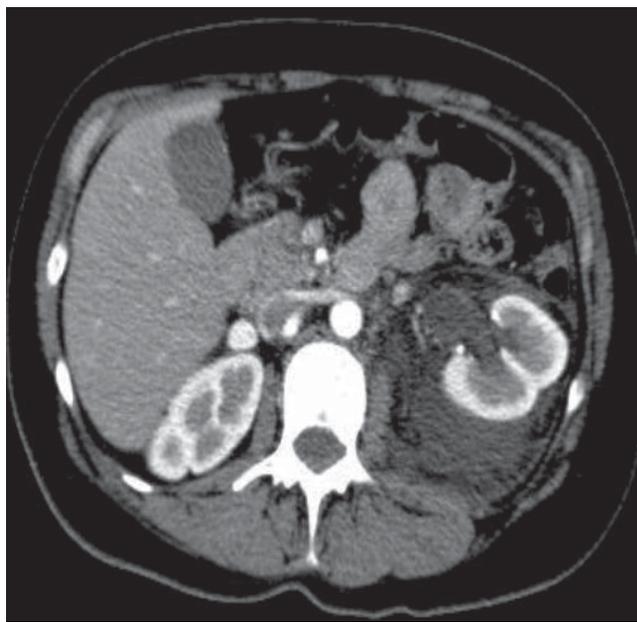
We performed a CT scan with iv contrast that showed us the following: retroperitoneal fluid collection in contact with the psoas and iliopsoas muscles, extending towards the pelvis, in the presacrococcygeal region; left lateral bladder wall with irregular outline, suggesting postoperative edema; minimal left hydronephrosis.

We established the diagnosis of spontaneous rupture of the left ureter with uroretroperitoneum, without an obvious obstructive cause, that could have explained the spontaneous ureteral rupture.

The patient's blood tests showed a spectacular increase in the value of leukocytes, 22.4 k / microL, as well as a slight increase in serum creatinine value, 1, 57 mg/dL.

We have performed an endoscopic intervention, under spinal anesthesia, and we have tried to place a double "j" left ureteral stent, but the left ureteral orifice was not visible as it was embedded in an area of intense edema. We abandoned the procedure and opted for open surgery. Under general anesthesia, we managed to find the left ureteral orifice and mount a ureteral double "j" left stent, through a properitoneal and transvesical approach and we also managed to place a catheter in the retroperitoneal space in order to drain the retroperitoneal collection.

Postoperative evolution was favorable. The retroperitoneal drainage tube was suppressed at 5 days after the



**Figure 5, 6.** CT scans- left ureterohydronephrosis with left retroperitoneal urinoma with extension towards the pelvis.

operation and the bladder catheter on the 10<sup>th</sup> day. The patient was discharged on the 11<sup>th</sup> day.

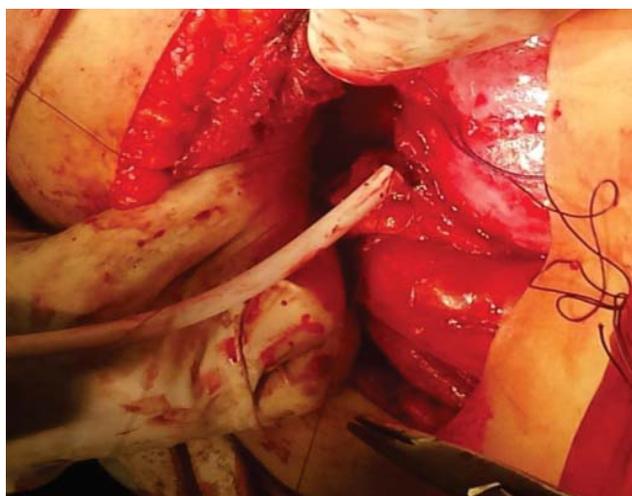
### Case 2

A 46 years old female patient, known with history of urinary lithiasis and multiple renal colics, was admitted in the emergency department with acute left flank pain radiating towards the anterior abdomen, intermittent macroscopic hematuria, fever and chills, symptoms which dated for almost 48 hours<sup>5</sup>.

The previous day, the patient presented to the emergency room where she was evaluated. Abdominal ul-



**Figure 7.** Intraoperative evacuation of the retroperitoneal urinoma.



**Figure 8.** Left ureter sutured after double j stent placement.

trasound and reno-vesical radiography were performed, investigations which revealed left I to II degree ureterohydronephrosis without any lithiasic obstacle. After analgesic i.v. treatment, the symptoms have decreased in intensity and the patient was sent home with medication and recommendation to return for medical reevaluation.

In the next 24 hours, the patient's general condition deteriorated and the pain increased in intensity, therefore she returned to the Emergency Room. Local examination revealed tenderness at superficial and deep palpation of the left hemiabdomen, as well as at same side flank.

The patient's blood tests revealed spectacular leukocytosis. Thus, if in the previous presentation, the leukocytes value was normal, within the second presentation to the emergency room their value increased to 27,000/mcL in just 24 hours.

Given the increasing intensity of the symptoms and the high leukocytes value we have performed contrast CT examination which revealed extravasation of the contrast from the renal pelvis in the retroperitoneum, thus we established the diagnosis of lumbar urinoma secondary to spontaneous rupture of renal pelvis. No obstructive urinary lithiasis was seen on the CT scans.

We decided to intervene and endoscopically tempted to place a double “J” left ureteral stent, but, regardless to the intraoperative maneuvers the procedure was not successful, due to the existing renal pelvis breach. No obstacle was to be found when passing the ureteral guide.

The positive diagnosis was: infected retroperitoneal urinoma. We abandoned the endoscopic surgery and opted for open surgery. We managed to evacuate the retroperitoneal urinoma (which extended below the bifurcation of the iliac vessels), we dissected the superior lumbar left ureter and the renal pelvis, we even mobilized the kidney, but we couldn't find the urinary collecting system breach responsible for the urinoma. In these conditions we have performed a minimum ureterotomy through which we managed to correctly place a double “J” ureteral stent.

The patient's postoperative evolution was favorable, the retroperitoneal drainage tube being suppressed at 7 days after the operation and the next day she was discharged. One month after surgery, the patient returned for ureteral stent removal. The CT examination performed at one month after the surgery revealed no pathological changes.

Although we haven't found the obstacle, considering the patient's lithiasic history, it is possible that the pelvis rupture may have been due to a temporary obstructive urinary stone.

## DISCUSSION

Spontaneous rupture of the urinary collecting system is a rare urologic pathology, which may require emergency surgery, depending on the gravity of the patient's status.

This pathology implies the existence of an urinary tract obstruction, followed by urinary stasis and increased intraluminal retrograde pressure, that may lead to spontaneous rupture of the collecting system, with retroperitoneal extravasation of urine causing severe complications such as retroperitoneal urinoma, infection, urosepsis, abscess formation and even severe renal impairment with loss of the kidney function<sup>1,2,6,7</sup>.

There are many pathologies that can cause spontaneous rupture of the urinary collecting system, but the most common cause cited in literature is represented by

urinary lithiasis obstruction<sup>1-4</sup>. In literature there have been published a number of rare cases of pathologies that have caused spontaneous rupture of the urinary collecting system, such as: ureteral rupture occurring during chemoradiotherapy in a patient with uterine cervical cancer without urinary obstruction, after hydration and furosemide treatment<sup>8</sup>; renal pelvis rupture in a pregnant women during intravenous infusion before cervical cerclage during spinal anesthesia<sup>9,10</sup>.

Regarding the symptomatology, most often it is similar to a renal colic, with sudden, severe flank pain, that may radiate to the lower abdomen, mimicking the symptoms of acute abdomen, with nausea and vomiting, anuria and even respiratory distress<sup>11</sup>. Differential diagnosis should include urinary lithiasis, cholecystitis, diverticulitis, appendicitis, pyelonephritis and other abdominal pain causes.

Due to its high accessibility, the ultrasonography represents the first line investigation in acute abdominal pain. It can reveal the presence of hydronephrosis, obstructive urinary lithiasis (ureteral or pelvic stones) and perinephric fluid collections, thus excluding other causes of acute abdomen and guiding us to the right diagnosis.

Intravenous contrast CT examination is considered to be the most useful investigation in the diagnosis of urinary collecting system rupture, due to its higher sensitivity when compared to other imaging investigations, such as ultrasonography and intravenous urography.

Contrast CT examination can confirm the presence of the urinary extravasation, the location and the degree of the leakage, its extent or abscess formation, as well as the cause of the obstruction that determined the appearance of the urinary leakage. In the absence of the tomographic examination, the intravenous urography is a useful investigation for visualizing the urinary tract. It can confirm the dilatation of the ureter and the renal pelvis and it can reveal the perinephric extravasation of urine containing contrast substance. However, the intravenous contrast CT examination is considered to be the investigation of choice in the diagnosis of the urinomas<sup>11,12</sup>.

The treatment options depend on the patient's status and on the urinary collecting system ruptures grade, and it should be individualized for each patient<sup>5</sup>. Recent studies emphasize the benefits of minimally invasive endourological surgeries, but when this type of surgery fails, classic surgery remains the saving solution.

Minimally invasive endoscopic treatment consists in the placement of a double “J” stent or percutaneous drainage of the urinoma by nephrostomy<sup>11</sup>. These endoscopic interventions are useful for small urinary

collecting system ruptures, while open surgery is the solution to more extensive ruptures and complicated cases.

The incidence of late complications after endourological surgery, such as ureteric strictures, periureteric fibrosis and ureteropelvic stenosis remains unknown, therefore endoscopic treatment is the first line in spontaneous urinary collecting system rupture.

## CONCLUSIONS

Urinary lithiasis obstruction is the most frequent cause of spontaneous rupture of urinary collecting system, followed by compressive causes and iatrogenic causes.

Perforation can occur at any level of the urinary collecting system, but it occurs more often at the level of the renal pelvis and upper ureter.

The symptoms are usually similar to a renal colic, but they can also mimic an acute abdomen, therefore the

differential diagnosis should be made with all the causes of acute abdominal pain.

Contrast CT examination is considered to be more useful than ultrasonography in establishing the diagnosis of spontaneous rupture of ureter or renal pelvis, due to its higher capacity of information achievement.

Nowadays the first line treatment is considered to be the endoscopic surgery (placement of double “J” catheter or percutaneous nephrostomy), due to its significant benefits when compared with open surgery.

If in ureteral stones cases, which are expected to pass under medical expulsive treatment, sudden clinical deterioration appears, the urinary collecting system rupture should be the first diagnosis to come in mind.

Considering the severe complications that can appear after a spontaneous ureteral or renal pelvis perforation (retroperitoneal urinoma which can lead to abscess formation or may determine sepsis) proper treatment should be promptly initiated.

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