Clinical History:

An 80-year-old male patient presented to the emergency department with right acute colicky flank pain, radiating into pelvis. There was no history of acute trauma. Blood tests showed normal renal function and WBC count. Urinalysis revealed microhematuria.

A second male patient (61-years-old) presented the next day, with the same clinical and laboratory findings.

Imaging Findings:

Ultrasound (US) examination of the first patient demonstrated a normal-appearing right kidney, right hydronephrosis and hydroureter and a small amount of perinephric fluid (Figure 1). Repeated US exam the next day revealed a ureteral calculus at the lower end of the right ureter (~2.5 cm from the vesicoureteral junction [VUJ]). Hydronephrosis and hydroureter were also noted, without any evidence of perinephric fluid (Figure 2).

The US exam of the second patient demonstrated a right kidney with normal length and echotexture, mild hydronephrosis, a small amount of perinephric fluid and a ureteral calculus at the level of the right vesicoureteral junction (Figure 3). The repeated US examination the next day again showed the ureteral calculus and the mild hydronephrosis, but did not demonstrate the presence of perinephric fluid (Figure 4).

The US findings of the two patients (ureteral stone, hydronephrosis, hydroureter and perinephric fluid) correspond to the secondary signs of acute ureteral obstruction.

Discussion:

In the presence of acute ureteral obstruction, accumulation of fluid in the renal interstitium will occur and renal edema will develop. The role of the renal lymphatics during obstruction is to drain excess fluid. Renal lymphatics are distributed in two intrarenal locations: deep within the renal parenchyma and in a subcapsular location. The deep lymphatics drain into the paraaortic lymph nodes, by forming larger trunks. As these trunks exit the renal hilum, subcapsular lymphatics join them [1].

The two systems of lymphatic channels communicate, via flow-directed valves, from the deep to the subcapsular system. Except from the deep and subcapsular lymphatics, perinephric lymphatics also exist and communicate freely with the subcapsular lymphatics, thus eventually draining into the paraaortic lymph nodes [1].

During obstruction, initially there is increased lymphatic flow into the deep system and towards the renal hilum. In
persistent, complete or high-grade obstruction, the progressive dilation of the renal pelvis will result in compression of the hilar lymphatics and diversion of flow to the subcapsular and perinephric lymphatics. In partial or intermittent obstruction, the diversion of lymphatic flow to the subcapsular and perinephric lymphatics will not be significant [1]. The perinephric space is divided into multiple compartments by the fibrous bridging septa [2]. The perinephric lymphatics run in or immediately adjacent to the bridging septa. Enlargement of the perinephric lymphatics and thickening of the fibrous bridging septa of the perinephric space are seen on CTs as linear perinephric stranding. Apart from the stranding of the perinephric fat, discrete foci of fluid in the perinephric space can be identified. This fluid collects in, between or along the fibrous bridging septa [1].

Forniceal rupture results in extravasated urine and the demonstration of more focal, nonlinear perinephric collections [3]. Acute rupture of the renal pelvis presents as substantial amounts of fluid around the affected kidney. If renal obstruction persists over time, renal lymphatics will drain excess fluid more effectively and the overall lymphatic drainage will be reduced. Therefore, perinephric stranding might be expected to diminish over time after reaching a maximum value (~8 h) [4].

The demonstration of ureteral stones (ureterolithiasis) in combination with dilatation of the collecting system (hydronephrosis), dilatation of the ureter (hydroureter) and/or perinephric fluid establish the diagnosis of an acute ureteral obstruction. Perinephric fluid alone is a good predictor of acute obstruction if it is unilateral and the patient has no past history of acute trauma, chronic or previous renal disease [5].

**Differential Diagnosis List:** Perinephric fluid in acute ureterolithiasis., perinephric fluid due to complicating acute pyelonephritis, perinephric fluid due to complicating acute renal failure

**Final Diagnosis:** Perinephric fluid in acute ureterolithiasis.

**References:**

Michael J.Varanelli, et al. (2001) Relationship between duration of pain and secondary signs of obstruction of the urinary tract on unenhanced helical CT. AJR 177(2):325-30 (PMID: [11461855](https://doi.org/10.2214/ajr.177.2.11461855))


Description: Right kidney.
Normal-sized right kidney with normal corticomedullary differentiation and cortical thickness.
Mild hydronephrosis.
Perinephric fluid. Origin: Radiology Department, General Hospital of Kastoria, Greece.
Description: Right kidney. Perinephric fluid. Origin: Radiology Department, General Hospital of Kastoria, Greece.
Description: Right kidney.
Perinephric fluid.
Hydronephrosis.
Dilatation of the right upper ureter. Origin: Radiology Department, General Hospital of Kastoria, Greece.
**Description:** Ureteral calculus (~2.5cm from the right vesicoureteral junction). **Origin:** Radiology Department, General Hospital of Kastoria, Greece.
**Description:** Right kidney.
Mild hydronephrosis.
Dilatation of the right upper ureter.
No perinephric fluid. **Origin:** Radiology Department, General Hospital of Kastoria, Greece.
Figure 3

Description: Ureteral calculus with posterior acoustic shadowing at the level of the right VUJ. Origin: Radiology Department, General Hospital of Kastoria, Greece.
b

Description: Right kidney.
Mild hydronephrosis.
Perinephric fluid. Origin: Radiology Department, General Hospital of Kastoria, Greece.

c

Description: Perinephric fluid (arrows). Origin: Radiology Department, General Hospital of Kastoria, Greece.
**Description:** Ureteral calculus at the level of the right VUJ. **Origin:** Radiology Department, General Hospital of Kastoria, Greece.
Description: Right kidney.
No perinephric fluid. Origin: Radiology Department, General Hospital of Kastoria, Greece.