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Pyelolymphatic backflow demonstrated by an abdominal CT: A case report

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Summary

Background:

Pyelolymphatic backflow phenomenon, which is a subtype of pyelorenal backflow, is a rare condition that occurs during the acute phase of urinary obstruction. Pyelorenal backflow has already been described in humans with retrograde pyelography. Our report presents a rare case of pyelolymphatic backflow demonstrated by a computed tomography.

Case Report:

A 67-year-old man with a history of bladder carcinoma was admitted to the emergency department due to right-sided flank pain and hematuria. Hematuria resolved after insertion of a 3-way urinary catheter, but flank pain persisted. As a result, an abdominopelvic CT was performed. CT revealed numerous tiny, serpiginous tubular structures connected with each other and filled with urine. They began intrarenally and extended caudally surrounding the ureter in the retroperitoneum. Subsequently, the patient underwent an ultrasound-guided nephrostomy to decompress the collecting system of the right kidney. Antegrade pyelography revealed minimal hydronephrosis. However, no leakage from the ureter to the retroperitoneum was observed, proving that the changes demonstrated by a CT were due to pyelolymphatic reflux caused by increased pressure in the collecting tubules filling the lymphatics with opaque urine.

Conclusions:

This report presents a very rare case of pyelolymphatic reflux demonstrated by a CT. We present this case report as a reminder that although rare, pyelolymphatic reflux can occur as a result of obstruction without manifestations of hydronephrosis and it can be confused with leakage from the ureter.

Keywords:

computed tomography • pyelolymphatic backflow • urinary obstruction

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Background

Pyelolymphatic backflow is a very rare condition that occurs when intrapelvic pressure rises acutely. Pressurized saline irrigation is commonly used during ureteroscopy and it may result in an increase in the intrarenal pressure leading to sepsis, postoperative pain and renal injury due to pyelovenous and pyelolymphatic backflow [1].

Retrograde studies had demonstrated pyelolymphatic backflow, while lymphangiography revealed prominent lymphaticocoliceal communications [2]. Intrarenal cortical and corticomedullary microlymphatics, as well as veins, become

filled following forniceal rupture and interstitial extravasation. These anatomically oriented studies suggest that renal lymphatics may function as an alternative drainage pathway of an acutely obstructed kidney [3]. We report a rare case of a pyelolymphatic reflux demonstrated by a CT examination. The characteristic features of a pyelolymphatic reflux on a computed tomography (CT) were analyzed to improve the understanding and diagnosis of this phenomenon.

Case Report

A 67-year-old man complaining of a right-sided flank pain and hematuria was admitted to the emergency department.



Figure 1. Axial CT image demonstrates tiny serpiginous tubular structures connecting with each other in the retroperitoneum.

He had a history of bladder carcinoma that was resected by transurethral resection of bladder tumor (TUR-BT) 2 years earlier and required re-excision followed by chemoradiotherapy. The patient was medically treated for hypertension.

On admission, his estimated glomerular filtration rate (GFR) was normal. Hemoglobin and creatinine levels were 9.5 g/dL and 0.88 mg/dL, respectively. Following insertion of a 3-way catheter to the bladder, hematoma was evacuated. On sonographic examination, no pathology was observed in the left kidney, however the collecting system of the right kidney was minimally dilated. His hematuria resolved within a few days, but flank pain persisted. As a result, an abdominopelvic CT was performed. CT revealed numerous tiny, serpiginous tubular structures connected with each other and filled with urine. They began intrarenally and extended caudally surrounding the ureter in the retroperitoneum (Figures 1 and 2A, 2B). No urinoma was found. Subsequently, the patient underwent an ultrasound-guided nephrostomy to decompress the collecting system of the right kidney. Antegrade pyelography revealed minimal hydronephrosis. However, no leakage from the ureter to the retroperitoneum was observed, proving that the changes demonstrated by a CT were due to pyelolymphatic reflux caused by increased pressure in the collecting tubules filling the lymphatics with opaque urine (Figure 3). Percutaneous nephrostomy led to the resolution of pain.

Discussion

Pyelorenal backflow phenomenon occurs during the acute phase of urinary obstruction due to increasing pressure in the renal pelvis. This phenomenon is very rare. It is associated with 5 types of backflow, which include: pyelocanalicular (pyelotubular), pyelointerstitial, pyelosinus, pyelovenous, pyelolymphatic. Among all of these phenomena, only pyelocanalicular backflow can be interpreted as a

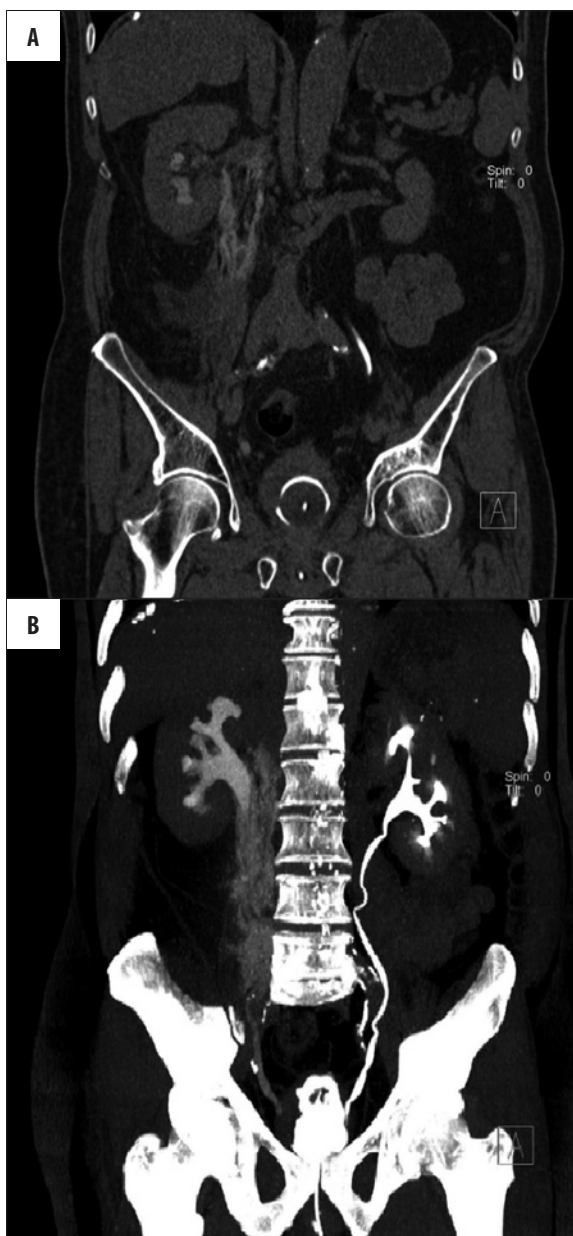


Figure 2. (A) Coronal reformatted images revealed periureteral lace-like densities. (B) Coronal MIP image shows same findings.

genuine backflow in the fullest sense of the word, while the others can never occur before the destruction of the fornix [4].

Microlymphatic channels begin in the cortical interstitium near the glomeruli, they run in close association with afferent arterioles and encircle interlobular arteries as a rete. Earlier animal studies have shown that lymphatic filling occurs only after forniceal rupture. Once this happens, lymphatics in the periaruate plexus at the corticomedullary junction are filled first. Subsequently interlobular, interlobar and perihilar lymphatics are visualized [3].

There are a few cases and experimental animal studies presented in the literature that were conducted with the help of conventional radiographic techniques [1,3,5,6]. However,

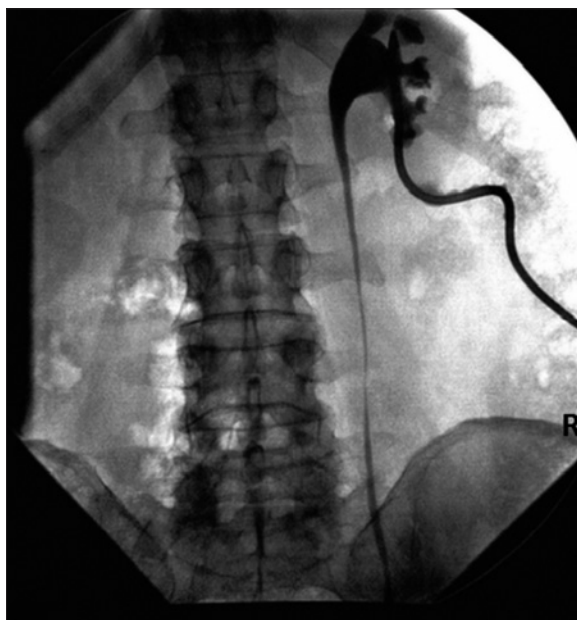


Figure 3. Antegrade pyelography image obtained with the patient in the prone position, shows no leakage from ureter to retroperitoneum.

this computed tomography case revealed increased density and streaks, which started at the renal sinus and continued caudally with a lace-like pattern surrounding the proximal ureter within the retroperitoneal adipose tissue. This finding can be confused with leakage from the ureter. Nevertheless, lack of urinoma and the characteristic lace-like density of lymphatic system suggest a pyelolymphatic reflux. The patient's pain and mild hydronephrosis also support the presumptive diagnosis. Furthermore, antegrade pyelography revealed that there was no direct leakage from the collecting system or the ureter to the perirenal or periureteral space. This suggested that the leakage of opaque urine observed on a CT was from the collecting tubules via

intrarenal lymphatics to the periureteral retroperitoneal lymphatics. On ultrasound examination there was no manifestation of hydronephrosis, but only minimally prominent calyces. In the presence of pyelorenal backflow, obstructive uropathy should be considered in similar cases, even in the absence of hydronephrosis.

Helin et. al. reported that in pigs, some renal functions may be preserved in the presence of a high-pressure retrograde flow, likely due to pyelolymphatic backflow [5]. In patients with symptoms of urinary obstruction however with normal renal function, obstructive uropathy could not be ruled out as pyelorenal backflow may prevent the kidney from deterioration.

Even though pyelovenous backflow is a major route for fluid resorption and recirculation in an obstructed kidney, the renal lymphatics provide another significant pathway for decompression. It is well known from physiologic studies in animals that renal lymph flow is increased in hydronephrosis, elevated renal venous pressure, allograft rejection and other instances of increased interstitial pressure. It has been shown that when intrarenal lymphatics are destroyed by infection, renal damage due to obstruction is much more rapid and pronounced [3].

The goal of treatment is the same for all types. The ureteral access sheath decreases the risk of pyelolymphatic and pyelovenous backflow by considerably decreasing the renal pelvic pressure [1].

Conclusions

The presented study described a very rare case of a pyelolymphatic reflux demonstrated by a CT. Pyelolymphatic reflux should be kept in mind in patients with obstructive uropathy, even in the absence of manifestations of hydronephrosis and normal renal function. CT scans can be helpful for the diagnosis.

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