Clinical History:

Elderly male patient with chronic congestive heart failure, diabetes, previous trans-urethral endoscopic resection for low-grade bladder urothelial carcinoma followed by intravesical chemotherapy, permanent Foley catheter, hospitalised because of haematuria and persistent fever despite empiric outpatient antibiotic treatment of urinary infection. Moderately febrile, profoundly asthenic with stable vital signs at physical examination.

Imaging Findings:

Months earlier, ultrasound (not shown) reported bilateral simple renal cysts, marked prostatic enlargement consistent with hyperplasia, diffuse urinary bladder mural thickening. Currently, laboratory disclosed normal renal function, anaemia (8.8 g/dL), leukocytosis, raised (74 mg/L) C-Reactive Protein. Abnormal urinalysis indicated persistent urinary infection, and intensive in-hospital treatment with intravenous antibiotics was started.

Contrast-enhanced CT at admission (Fig.1) showed normal-sized kidneys for age, minimally delayed nephrogram, two partially exophytic renal masses with inhomogeneous attenuation, peripheral and septal enhancement, plus a perirenal lymph node with analogous enhancement features.

Urine and blood cultures tested positive for Escherichia coli systemic infection. Five days later, MRI (Fig. 2) confirmed complex renal masses with thickened enhancing walls and septa, internal fluid-like content with restricted diffusion, consistent with abscesses invading the peri- and pararenal spaces.

Clinical and laboratory improvement was finally obtained. Anaemia was attributed to chronic illness. Three weeks later, repeated MRI (Fig. 3) showed regression of renal abscesses and lymphadenopathy.

Discussion:

The most common bacterial infections, the majority of adult urinary tract infections (UTIs) result from ascending urethral infection with usual urinary pathogens such as Escherichia coli or Proteus. High-risk populations include pregnant females, the elderly, patients with diabetes, underlying urologic abnormalities, neurogenic bladder, catheters, and immunosuppression [1, 2].

Most usually, diagnosis of UTI is straightforward on the basis of clinical features, acute phase reactants, urinalysis, and urine culture. Most UTIs are treated in the outpatient setting, do not routinely require imaging, and are promptly relieved by appropriate antimicrobial therapy [1, 3].

However, UTIs range in severity from minimally symptomatic cystitis to life-threatening bacteraemia (urosepsis). According to current guidelines, indications for imaging include recurrent or severe UTIs, elderly males, failure to
improve after 3 days of antibiotic treatment, and conditions predisposing to infection and complications, particularly diabetes and immunosuppression [3, 4].

Although ultrasound rapidly allows to detect urinary obstruction and pyonephrosis requiring drainage, currently contrast-enhanced CT is usually the preferred modality to investigate severe UTI and possible complications, and has high accuracy to diagnose acute pyelonephritis [2, 4-6].

As this case exemplifies, severe UTIs should not be underestimated, as they may lead to systemic sepsis and require intensive in-hospital treatment. At CT intra- and perirenal abscess collections appear as hypoattenuating lesions with thick irregular peripheral enhancement and fluid-like central components, which may sometimes invade the retroperitoneal spaces, psoas muscles, or abdominal wall structures. Sometimes resembling complex cystic lesions, infectious-inflammatory masses with or without perirenal extension may not be easily differentiated from necrotic tumours. Besides the clinical context, identification of perirenal fat inflammatory stranding and thickening of Gerota's fascia help in this setting [5, 6].

Furthermore, MRI is increasingly employed to investigate possible renal infections, particularly in young patients or with contraindication to iodinated contrast medium. On MRI, abscesses show peripheral and septal enhancement after intravenous gadolinium, whereas the internal collections have inhomogeneous fluid-like T1-hypointense and T2-hyperintense signal. On diffusion-weighted imaging (DWI) the non-enhancing purulent content shows very high signal intensity, compared to the DWI-hypointense unrestricted diffusion in fluid-like necrotic areas within renal carcinomas. Therefore, marked restricted diffusion in heterogeneous, partly fluid-like indeterminate renal lesions favours inflammation, whereas relatively free diffusion (with restricted diffusion in the solid portions) suggests tumour. Finally, cross-sectional imaging with CT and MRI is of paramount importance in follow-up of severe or complicated UTI, and when the diagnosis of renal abscess is initially uncertain [5-7].

**Differential Diagnosis List:** Renal abscesses in urosepsis., Uncomplicated urinary tract infection, Pyelonephritis, Xanthogranulomatous pyelonephritis, Renal tuberculosis, Haemorrhagic cysts, Renal cell carcinoma, Renal lymphoma

**Final Diagnosis:** Renal abscesses in urosepsis.

**References:**


Description: Besides some simple cysts bilaterally, CT reveals two right-sided partially exophytic renal masses (arrowheads) with inhomogeneous attenuation on unenhanced images (a,b). Origin: Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)
Description: Besides some simple cysts bilaterally, CT reveals two right-sided partially exophytic renal masses (arrowheads) with inhomogeneous attenuation on unenhanced images (a,b). Associated ipsilateral fascial thickening (thin arrow). Origin: Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)
Description: Contrast-enhanced images confirm normal renal size and parenchymal thickness for age, with minimally delayed nephrogram, and some simple renal cysts bilaterally. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
**Description:** The two right-sided partially exophytic renal masses (arrowheads) invade the peri- and pararenal spaces. After intravenous contrast, peripheral and septal enhancement is appreciated with fluid-like content. **Origin:** Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
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**Description:** Note thickened retroperitoneal fasciae (thin arrows) and imbibition of perirenal fat space (*) on fat-saturated T2-weighted images. **Origin:** Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
**Description:** After intravenous gadolinium contrast, T1-weighted MRI images confirm marked peripheral and septal enhancement in the two right-sided complex masses (arrowheads). **Origin:** Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
Description: After intravenous gadolinium contrast, T1-weighted MRI images confirm marked peripheral and septal enhancement in the two right-sided complex masses (arrowheads). Note enhancing thickened fasciae (thin arrows) with fat suppression. Origin: Tonolini M, Radiology Department, "Luigi Sacco" University Hospital – Milan (Italy)
Description: Repeated MRI including T2-(a,b), unenhanced (c) and post-contrast (d) T1-weighted images show resolution of both right-sided partially exophytic renal abscesses (arrowheads), and of perirenal adenopathy. Note multiple simple renal cysts bilaterally. Origin: Tonolini M, Radiology Department, “Luigi Sacco” University Hospital – Milan (Italy)
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