CASE REPORT

Sepsis due to pyonephrosis: an adult with pelvic–ureteric junction obstruction (PUJO) in a duplex kidney

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Abstract We present the case of a 75-year-old woman with sepsis. She was evaluated with bedside ultrasound with a diagnosis of pyonephrosis, and subsequently underwent a TC scan that showed a pelvic–ureteric junction obstruction (PUJO) in a duplicated renal system. PUJO associated with duplex kidney, while relatively frequent in children, is a rare condition in adults, and may lead to severe complications as in this case.

Keywords Ultrasound · Sepsis · Pyonephrosis · Duplex kidney · PUJO

Riassunto Presentiamo il caso di una donna di 75 anni affetta da sepsi. E' stata valutata con ecografia al letto del malato con una diagnosi di pionefrosi, successivamente è stata sottoposta a TC che ha dimostrato una ostruzione del giunto pieloureterale (PUJO) in un sistema renale duplicato. PUJO associata a doppio distretto, relativamente frequente nel bambino, è un condizione rara nell'adulto, a può condurre a complicazioni severe come in questo caso.

Introduction

Ultrasound is often the first line imaging technique in patients presenting with sepsis, widespread use can lead to the detection of uncommon findings such in this case.

Case report

R.N., a 75-year-old woman, was hospitalized for fever that had begun 7 days before and was associated with pain in the left flank. She had an history of type two diabetes and chronic HCV hepatitis.

At the clinical examination on arrival in our medical ward, she was in septic shock, with low blood pressure (90/50 mmHg), tachycardia (110 bpm), mild tachypnea (24/min) and mild fever (37.1 °C). Biochemical tests demonstrated leukocytosis ($12.78 \times 10^9/l$), high C-reactive protein (119 ng/l), mild renal failure (serum creatinine 129 $\mu\text{mol/l}$) and metabolic acidosis with elevated lactates (pH 7.25, pCO_2 30.3 mmHg, HCO_3^- 13.0 mmol/l and Lactates 10.0 mmol/l). She immediately underwent bedside ultrasound (US), both to evaluate cardiovascular involvement (inferior cava vein) and to investigate the possible source of infection. US showed a marked hydronephrosis of the lower moiety of the pelvis, with some fluid debris inside; no evidence of renal stones. (Fig. 1)

We started volume expansion with normal saline 500 ml/h. In the suspect of renal abscess, we started antibiotic therapy with intravenous levofloxacin. Inotropic support with vasopressors (dopamine) was also needed.

As the patient's conditions had stabilized a TC scan was done (Fig. 2): the hydronephrosis was confirmed and US-guided percutaneous drainage was carried out.

In the following days, we observed a further remission of sepsis complications and a second TC with three dimensional reconstruction (Fig. 3) was required, showing a lower moiety pelvic–ureteric junction obstruction (PUJO) of a duplex kidney with pyonephrosis.

The case was discussed with our urology consultants, and due to the old age of our patient, and the comorbidity (diabetes and chronic hepatitis), the case was treated

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Fig. 1 Ultrasound examination showing a marked hydronephrosis of the lower moiety of the pelvis with some fluid debris inside. **a, b** Long axis view; **c, d** short axis view. **b, d** Color representing different

structures. *Blue* renal parenchyma; *pink* renal collecting system; *light green* hydronephrosis; *dark green* debris

Fig. 2 TC scan confirming hydronephrosis of the lower moiety of the pelvis. **a** TC scan; **b** color representing different structures. *Blue* renal parenchyma; *light green* hydronephrosis

conservatively: after the complete resolution of the infection, the drainage was removed; at clinical follow-up after 1 year, no further urinary tract infections or other complications had occurred.

Discussion

Duplication of the renal–ureteral system is the most common congenital renal abnormality. Duplication can be complete, with two distinct ectopic ureteral insertions to the bladder, or incomplete with the two ureters uniting more proximally and draining into the bladder via a single insertion. In the complete form, the upper moiety ureter is more susceptible to obstruction, due to a ureterocele, to ectopic insertion of the ureter, or to an aberrant artery. On the other hand, incomplete duplication is less frequently symptomatic due to fewer complications; however, when partial duplication is associated with obstruction of the lower moiety junction to the ureter (PUJO), as in this case, obstructive and infectious complications can occur.

True incidence of the association of incomplete duplicated renal system with lower moiety obstruction is difficult to estimate, but data from literature range from 2 to 7 % of incidence of PUJO among children with duplex kidney [1, 2] undergoing pyeloplasty.

The typical appearance involves a smaller upper moiety with only two major calyces and a larger lower moiety with three major calyces.

In adult age, PUJO is a rare occurrence; it can be detected because of infectious complication [3, 4], but it can also be identified in asymptomatic individuals during routine ultrasound imaging [5]. Cases of sepsis in subjects

Fig. 3 TC scan 3D reconstruction showing a lower moiety pelvic–ureteric obstruction (PUJO) of a duplex kidney with pyonephrosis. **a** Right-anterior view; **b** anterior view

with such conditions have been described in patients as old as 86 years [6].

As endorsed by sepsis guidelines [7], bedside ultrasound examination is often the first imaging technique in patients with severe sepsis and septic shock. Ultrasound can be helpful in identifying the source of infection [8–11]; it can help define and monitor the hemodynamic status of the patient via evaluation of inferior vena cava, heart and lung water [12–14]; it can guide invasive procedures in both diagnosis (sampling) and treatment (drainage) [15].

Pelvic–ureteric junction obstruction can be seen on ultrasound scan as localized dilated pelvicalyceal system in the lower moiety. The renal parenchyma near the dilatation can be thinned and highly hyperechoic. In the presence of pyonephrosis, as shown in our case, a fluid debris appearance may be seen; this is important to recognize as it makes the PUJO complicated and, therefore, an urological emergency.

The sonographic suspicion of PUJO must be confirmed by conventional urography or, as in our case, a CT urography with a three dimensional reconstruction, as the morphological characteristic of the obstruction influence the future management.

Emergency treatment of pyonephrosis is percutaneous nephrostomy, with concomitant medical treatment with antibiotics and hemodynamic support. While the treatment of asymptomatic uncomplicated PUJO is still under discussion [5], surgical correction of the joint obstruction in complicated cases is usually indicated, particularly in children and adults with no severe comorbidity. Treatment options include pyeloplasty, pyeloureterostomy, endopyelotomy or

heminephrectomy [3] depending on the site of obstruction and residual renal function. Our patient, due to high operative risk, underwent a clinical follow-up with no recurrence of infection.

Conclusion

Pelvic–ureteric junction obstruction in duplicated renal system is a rare condition in adults. Ultrasound may be useful in detecting the dilated pelvicalyceal system and its major complication, the pyonephrosis.

Conflict of interest Francesco Simoni and Nicola Vitturi declare that they have no conflict of interest.

Informed consent All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. All patients provided written informed consent to enrollment in the study and to the inclusion in this article of information that could potentially lead to their identification.

Human and animal studies The study was conducted in accordance with all institutional and national guidelines for the care and use of laboratory animals.

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