

Emphysematous Pyelonephritis Treated with Vacuum Sealing Drainage

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Emphysematous pyelonephritis (EPN) is a rare infectious disease, of which risk factors are poorly controlled diabetes mellitus, immunosuppression, and urinary tract obstruction.^[1,2] In comparison with simple pyelonephritis, EPN is an acute severe necrotizing and gas-forming infection of the renal parenchyma with a mortality rate of up to 25%.^[3] Among the reported cases of EPN, there has only been one report of the disease where the “invisible kidney” was detected in the lung windows on noncontrast abdominal computed tomography (CT). This rare case was treated with vacuum sealing drainage (VSD, Weigao Holding, China) and recovered quickly.

We reported an unusual case of a patient who suffered from EPN. A 46-year-old woman presented to the emergency department with complaints of a one week history of fever, chills, and right flank pain. No urinary symptoms were reported. The patient had diabetes mellitus with poor glucose control. She had no other previous significant medical history. The patient was in poor general condition.

On examination, the following was recorded: pulse 120 beats/min, blood pressure 90/60 mmHg (1 mmHg = 0.133 kPa), temperature 39.5°C, respiration 18 breaths/min. The patient appeared in distress, and her abdomen was mildly distended. There was marked tenderness in right lumbar and hypochondriac area. Rest of the examination was normal. Blood investigations revealed hemoglobin (Hb) of 115 g/L, total white cell count $29.41 \times 10^9/L$, platelet count $520 \times 10^9/L$, red blood cells (RBC) $4.12 \times 10^{12}/L$. Urine analysis showed ketone 4+, glucose 4+, albumin 2+, hematuria 2+, proteinuria 2+, and pus cells 80/hpf. Blood urea was 15.6 mmol/L and serum creatinine (Scr) 140 $\mu\text{mol}/L$. Random blood glucose was 28.9 mmol/L. Arterial blood gas analysis showed mild metabolic acidosis. Compensated metabolic

acidosis (pH 7.285, pCO₂ 9.7 mmHg, PO₂ 88.8 mmHg, HCO₃ 4.7 mmol/L, and base excess -18.1 mmol/L). Total serum bilirubin was 4.4 $\mu\text{mol}/L$ (direct 2.3 $\mu\text{mol}/L$). Hepatic transaminases were normal. Serum proteins were 70.9 g/L with an albumin of 33.6 g/L. Serum sodium, potassium, calcium, phosphorous, and uric acid estimations were normal. Human immunodeficiency virus (HIV) and hepatitis B surface antigen (HBsAg) tests were negative.

Electrocardiogram and chest X-ray did not reveal any abnormality. Ultrasound showed intense reflections with dirty acoustic shadows in the right kidney area indicative of the presence of gas. CT scan of the abdomen showed bulky gas in the right renal fossa. However, the patient's right kidney was not detected [Figure 1a]. The immediate motive was to make this kidney visible. A CT scan was done in an attempt to see the kidney in the lung window with success - the kidney was visible this time with no signs of obstruction or stones [Figure 1b]. She was diagnosed with EPN and uncontrolled hyperglycemia. She was started empirically on levofloxacin injection, placed on intravenous fluids and insulin infusion pump.

Drainage catheter was placed through a small incision immediately after admission with some gas and pus was extracted. Blood culture and pus culture grew *Escherichia coli* which are sensitive to imipenem and meropenem which prompted us to change the antibiotics to intravenous imipenem. After drainage, the CT scan showed that there

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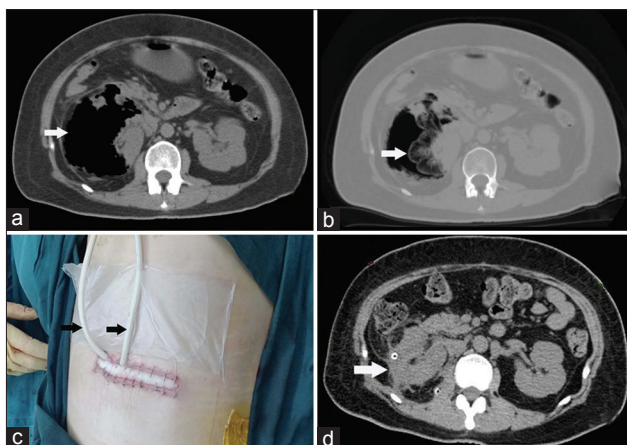


Figure 1: CT showed air densities (arrow) in the perinephric spaces and retroperitoneum, and the kidney was not found (a). The “invisible kidney” (arrow) was detected in the lung window (b). Negative low-pressure VSD (arrows) treatment was conducted in a closed condition (c). The kidney (arrow) recovered after VSD (d). CT: Computed tomography; VSD: Vacuum sealing drainage.

was still much gas and pus around the kidney, at which point it was decided that VSD was to be used. VSD sponge was tailored and placed at the ventral and dorsal position of the kidney leaving no dead space. Negative low-pressure VSD treatment was conducted in closed condition [Figure 1c]. The VSD was removed one week later, and debridement was performed again. Following debridement, the VSD sponge was tailored to veil the kidney which quickly recovered [Figure 1d]. Renal function test, urine test, and white blood cell count normalized. The patient was discharged from the hospital.

EPN is an acute severe necrotizing and gas-forming infection of the renal parenchyma; in some cases, there could be a lot of gas around the kidney which causes it to be indistinguishable in CT images. It is not so straight forward to make the kidney appear in CT images; however, reading abdominal CT in the lung window can be helpful in the detection of the kidney as well as adjusting the contrast and brightness of these images.

Nephrectomy or open drainage is suggested in most patients with no improvement on antibiotics.^[4] Open drainage was not very useful for the patient because there was a still lot of gas around the kidney; however, a VSD device was adopted, and the gas and pus disappeared quickly. There are many advantages of VSD device in the treatment of this disease such as keeping the wound clean, inhibiting the growth of anaerobic bacteria, controlling the spread of the anaerobic bacteria, eliminating dead space, and stimulating the growth of healthy granulation tissue.

In conclusion, the disappeared kidney in EPN cases can be found again through adjusting CT window as well as the contrast and brightness. A VSD device might be a good method to treat this kind of disease.

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Conflicts of interest

There are no conflicts of interest.

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