



Case report

Successful nephrectomy after a failure of non-surgical treatment in emphysematous pyelonephritis: A case report



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ARTICLE INFO

Keywords:

Case report
Emphysema
Nephrectomy
Pyelonephritis

ABSTRACT

Emphysematous pyelonephritis (EP) is an uncommon condition involving acute severe necrotising infection in the renal parenchyma, perinephric space and collecting system, with a mortality rate of up to 13%. A 62-year-old male with poorly controlled diabetes mellitus presented with severe epigastric pain and shortness of breath for three days. A computed tomography scan revealed class 3B EP, which failed medical therapy and percutaneous drainage. He underwent a nephrectomy and achieved an excellent clinical recovery. Septic shock and uncontrolled diabetes mellitus are two risk factors that lead to a poorer prognosis. Class 3B EP with failed medical therapy and percutaneous drainage would benefit from nephrectomy.

1. Introduction

Emphysematous pyelonephritis (EP) is an uncommon condition involving acute severe necrotising infection in the renal parenchyma, collecting system and perinephric tissue [1]. Mortality rates can reach as high as 13% [2]. The risk factors for mortality include old age (≥ 65 years), being male, abnormal kidney function, thrombocytopenia, disseminated intravascular coagulation, shock, disturbed consciousness levels, immunosuppression, hypoalbuminaemia and Huang–Tseng classification III–IV [2, 3]. EP predominantly occurs in patients with diabetes mellitus and urinary tract infections [2]. *Escherichia coli* and *Klebsiella pneumoniae* are among the most common causative pathogens that may lead to EP [2]. The diagnosis can be established based on the gas pattern on non-contrast computed tomography (CT) imaging. The Huang–Tseng classification is used to grade EP based on the radiological findings [1]. With the evolution of medical care, EP is treated by a multidisciplinary team consisting of the intensive care, radiology, urology and nephrology teams. We describe a 62-year-old male who presented with septic shock secondary to EP and highlight our management approaches.

A 62-year-old male with underlying uncontrolled diabetes mellitus presented to the hospital with severe epigastric pain and shortness of breath for three days. A clinical examination noted that he was septic,

tachypnoeic, tachycardic and hypotensive, despite fluid resuscitation. His temperature spiked to 38 °C and blood sugar was 20 mmol/L, requiring the use of intravenous insulin. The lungs had bilateral lung base crepitations and the abdomen was distended with crepitus, which was felt at the right lumbar region and extended down to the patient's scrotum. He developed rapid clinical deterioration leading to one episode of cardiopulmonary resuscitation. The patient was intubated and started on inotropic support.

The haematological and biochemical investigations revealed the following: a white cell count of 70 (normal value: $4\text{--}11 \times 10^9/\text{L}$), thrombocytopenia of 14 (normal value: $140\text{--}400 \times 10^9/\text{L}$), C-reactive protein of 248 (normal value: $<5 \text{ mg/L}$), deranged renal profile with a serum creatinine of 578 (normal value: $50\text{--}110 \mu\text{mol/L}$), urea of 47.6 (normal value: $2\text{--}6 \text{ mmol/L}$), coagulopathy and mild transaminitis. Blood gas showed severe metabolic acidosis. Ultrasonography revealed an absence of the right kidney. The subsequent CT scan showed gas production in the renal parenchyma keeping with right EP (Figure 1A). Air locules extended from anterior/posterior liver space, retroperitoneum, lateral abdominal muscle, pelvis and scrotum (Figure 1B).

Through a multidisciplinary approach, a unanimous decision was reached that a surgical approach was deemed inappropriate at the initial stage. The standard treatment approaches for sepsis were followed, such

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<https://doi.org/10.1016/j.heliyon.2022.e11070>

Received 1 April 2022; Received in revised form 7 August 2022; Accepted 10 October 2022

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Figure 1. (A) CT of the abdomen at axial cut showing gases in the right renal parenchyma. (B) The gas (*) tracking down the pelvis.

as fluid resuscitation, insulin therapy and antibiotic therapy. The patient was treated empirically with renal-adjusted antibiotic dosage (IV Meropenem). Cultures later grew Gram-negative bacilli (*Klebsiella pneumoniae*) both from the blood and pus, in which the antibiotic was adjusted according to the microbiological culture. An image-guided pigtail was placed into the right renal collection. The decision to undertake surgical intervention was made after three weeks of conservative management due to the poor clinical response to antibiotics and drainage. The extraperitoneal approach was taken to the paranephric space. Intraoperatively, 200 mL of pus was tracking down to the preperitoneal space of the psoas muscle, with an unhealthy and atrophic right kidney. A nephrectomy was performed (Figure 2). The histological diagnosis was consistent with acute pyelonephritis with emphysematous pyelonephritis. He achieved a good clinical recovery and was subsequently discharged successfully.

2. Discussion

Imaging modality plays a major role in diagnosing and managing genitourinary conditions, including EP [4, 5]. Ultrasonography is helpful in showing gas bubbles in the hepatorenal space, as evidenced by a hyperechoic focus of dirty shadowing and comet-tail artefacts, mimicking a “mini-waterfall” [6]. Abdominal CT is necessary for early diagnosis and further management [1]. The radiological classification developed by Huang and Tseng in 2000 was based on CT findings and offers subsequent treatment modalities [1]. The combinations of radiological classification and risk factors such as diabetes, thrombocytopenia, acute renal failure, altered levels of consciousness and shock determine the prognosis and subsequent management [1]. Basic resuscitation, oxygen support, intravenous fluid, acid-base balance correction and broad-spectrum antibiotics should be commenced, along with good sugar control. If clinical conditions and laboratory results show

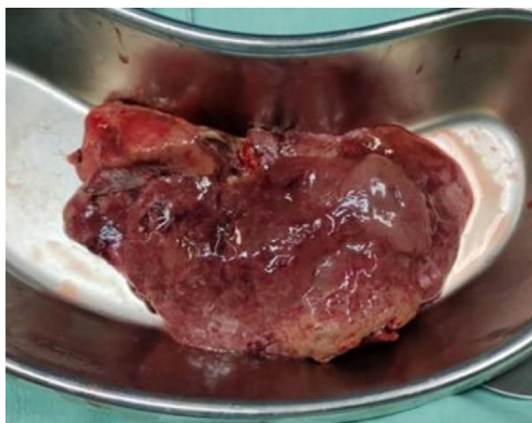


Figure 2. Right nephrectomy specimen.

deterioration, the level of care should be raised as patients may require multi-organ support. Gram-negative organisms are the most common organism and the initial antibiotics should target them.

The treatment strategies include medical management alone; percutaneous drainage plus medical management; medical management plus emergency nephrectomy and percutaneous drainage; or medical management and emergency nephrectomy [7]. Patients with percutaneous drainage and medical management will benefit from repeat CT in four to seven weeks as a reassessment to look for fluid or collection and aid in planning for nephrectomy in non-responders. Class 1 and 2 EP have good prognoses with medical management alone or combined with drainage. Class 3 and 4 have more than two risk factors and are unsuccessful with medical therapy and drainage. This subgroup has a higher proportion for nephrectomy than class 1 and 2. Herein, we report a rare case of class 3B EP that was successfully treated with medical therapy, followed by percutaneous drainage and nephrectomy after three weeks of no improvements. The key to our success was adequate resuscitation from admission and early diagnosis with an abdomen CT, followed by surgical intervention. Our case report suggests that nephrectomy plays a vital role in the management of EP.

A small proportion of patients who had managed with medical management and percutaneous drainage required nephrectomy; the mortality rate was 6.6% [1]. The factors that can lead to failed conservative treatment include thrombocytopenia, severe hypoalbuminaemia, polymicrobial infections, initial presentation with septic shock, and emergency haemodialysis [8, 9]. This report also reports a higher rate of nephrectomy in the class 3 group [1]. Nephrectomy can be simple, radical or laparoscopic. EP will also require renal support measures in the form of dialysis, which helps to reduce mortality [1]. The long-term outcome depends on the degree and amount of parenchymal loss and coexisting renal disease [1].

3. Conclusion

EP is a severe type of renal infection. Surgical treatment is definitive in cases not responding to non-surgical therapy.

Consent

Written informed consent was obtained from the patient to publish this case report and accompanying images. Permission was also obtained from local administrators. A copy of the written consent is available on request.

Declarations

Author contribution statement

All authors listed have significantly contributed to the investigation, development and writing of this article.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

Acknowledgements

We would like to thank the Director-General of Health, Ministry of Health Malaysia for allowing us to publish this article. We also thank those who had managed the patient either directly or indirectly throughout the follow-up period.

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