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Coexistence of Emphysematous Pyelonephritis Related to Renal Tuberculosis, Iliopsoas Abscess and COVID-19 Pneumonia Presenting as Diabetic Ketoacidosis: A Case Report and Review of the Literature

Diyabetik Ketoasidoz ile Kendini Gösteren Renal Tüberküloz İlişkili Amfizematöz Piyelonefrit, İliopsoas Apsesi ve COVID-19 Pnömonisi Birlikteliği: Bir Olgu Sunumu ve Literatürün Gözden Geçirilmesi

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Abstract

Concurrence of emphysematous pyelonephritis (EPN) related to renal tuberculosis and iliopsoas abscess is exceedingly rare, and its coexistence with COVID-19 pneumonia presented as "diabetic ketoacidosis" may have fatal consequences. A 46-year-old diabetic female patient was manifesting signs of septic shock; unconsciousness, febrile episodes, tachycardia and tachypneia when she was first admitted to our emergency department. She had positive real-time PCR test results for COVID-19 four days before her admission with symptoms of abdominal pain, fever, nausea, weakness, chest tightness, and shortness of breath persisting for a week. Blood test results were consistent with diabetic keto acidosis. Computed tomography (CT) showed left-sided emphysematous pyelonephritis and iliopsoas abscess. The patient was managed using percutaneous drainage and empirical antibiotics. Besides, renal tuberculosis was identified in the patient who did not respond to the treatment offered. As a result, a poor glycemic control may cause various fatal clinical complications. Concurrence of emphysematous pyelonephritis and iliopsoas abscess may be devastating for the patient that must be promptly managed to avoid any occurrence of septic shock. As the response to the treatment offered was inadequate, the coexistence of other disease states as renal tuberculosis was contemplated.

Keywords: emphysematous pyelonephritis, renal tuberculosis, iliopsoas abscess, COVID-19 pneumonia, diabetic ketoacidosis

Öz

Amfizematöz piyelonefrit, renal tüberküloz ve iliopsoas apsesinin birlikteliği son derece nadirdir ve COVID-19 pnömonisi ile birlikte "diyabetik ketoasidoz" olarak ortaya çıkması ölümcül bir duruma neden olabilir. 46 yaşında diyabetik kadın hasta bilinç bulanıklığı şikayeti, ateş, taşikardi ve takipne ile septik şok tablosunda acil servisimize başvurdu. Öyküsünde son bir hafta boyunca karın ağrısı, ateş, mide bulantısı, halsizlik, göğüste sıkışma ve nefes darlığı gibi yakınmaları ve başvurudan dört gün önce COVID-19 için gerçek zamanlı pozitif PCR testi vardı. Kan testi sonuçları diyabetik ketoasidoz ile uyumluydu. Bilgisayarlı tomografide (BT) sol taraflı amfizematöz piyelonefrit ve iliopsoas apsesi görüldü. Hasta perkütan drenaj ve ampirik antibiyotikle tedavi edildi. Tedaviye yeterli yanıt alınamayan hastada ek olarak böbrek tüberkülozu da saptandı. Sonuç olarak, kötü bir glisemik kontrol, çeşitli ölümcül klinik komplikasyonlara neden olabilir. Amfizematöz piyelonefrit ve iliopsoas apsesinin birlikteliği hasta için ölümcül olabilir ve septik şok oluşumunu önlemek için hızlı tanı ve tedavi edilmelidir. Tedaviye yetersiz yanıt varlığında başta böbrek tüberkülozu olmak üzere olası diğer etken mikroorganizmalar akla getirilmelidir.

Anahtar kelimeler: amfizematöz piyelonefrit, böbrek tüberkülozu, iliopsoas apsesi, COVID-19 pnömonisi, diyabetik ketoasidoz

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Introduction

One of the major severe acute consequences of diabetes mellitus (DM) is diabetic ketoacidosis (DKA). The outbreak of the newly emergent severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) disease has been a major cause of death for the last two years.

The COVID-19 pandemic has been disruptive for many patients worsening their dietary and exercise habits. As is known, poor glycemic control causes various fatal clinical complications such as infectious diseases. Emphysematous pyelonephritis (EPN) is a rare, but potentially fatal necrotic kidney infection that usually leads to septic shock and its frequency is higher in patients who are immunocompromised, especially those with DM (87-97%) [1]. Mortality rates have been estimated to be as high as 80% in cases of misdiagnosis or delayed treatment. Most common causative organisms are Enterobacteriaceae; especially Escherichia coli and Klebsiella pneumoniae [2]. On the other hand, another infectious agent Mycobacterium tuberculosis that causes the disease called tuberculosis (TB), is still an important public health issue in developing countries. Urogenital TB comprises 27% of extrapulmonary cases of TB. Renal involvement in TB is manifested as part of a disseminated infection or a localized genitourinary disease [3]. A very rare clinical scenario is EPN concurrent with iliopsoas abscess (IPA) [4].

Herein, we present a case of DKA in a patient having concurrent EPN, IPA and COVID-19 pneumonia along with a critical review of the previous literature to contextualize our observations. There are two salient features in this case which make the problem unique: i) the condition manifested itself in the context of multiple fatal conditions, ii) the condition highlighted in this case coexisted with COVID-19 pandemic, DKA, EPN, IPA and renal TB which are all successfully managed with good clinical outcomes.

Case

A 46-year-old female patient suffering from unconsciousness was admitted to our emergency department. She had past history of uncontrolled type 2 DM for 15 years with poor control of blood glucose due to noncompliance with the insulin treatments, and bipolar disorder for two years. She had positive real-time PCR test results for COVID-19 four days before her admission and had complaints of abdominal pain, fever, nausea, weakness, chest tightness, and shortness of breath for a week. In the emergency department, the patient was febrile, and the results of her baseline examinations were as follows: oral temperature, 37.6°C; tachycardic heart rate, 103 bpm; tachypneic respiratory rate, 34/min, and blood pressure, 112/67 mmHg.

Blood test results were as follows; blood glucose level, 670 mg/dL; arterial blood gas pH, 7.17; partial pressure of carbon dioxide PCO_2 21.8 mmHg; HCO_3 16.4 mEq/L; partial pressure of oxygen PO_2 112 mmHg and, an elevated anion gap which were all consistent with DKA. Findings were further confirmed by the presence of ketonuria, bacteriuria and glucosuria. Results of biochemical tests were as follows: serum creatinine, 2.64 mg/dL; sodium, 124 mmol/L; lactic acid, 2.4 mmol/L; C-reactive protein (CRP), 346 mg/L; procalcitonin, 62.14 ng/mL; neutrophilia: neutrophil count: 17.8×10^9/L and thrombocytopenia: platelet count: 4×10^9/L; hypoalbuminemia: serum albumin: 20.8 g/L consistent with a severe, acute inflammatory response, bone marrow suppression (hemoglobin: 6.4 g/L, and hematocrit: 18%) and an acute kidney injury. Her chest X-ray showed bilateral peripheral focal areas of ground glass opacities and consolidation at the left middle and the lower lung zones. After the initial assessment, the patient was referred to intensive care unit (ICU). Management included intravenous infusion of hydration and small doses of insulin to correct ketoacidosis. Renal functions returned to normal after infusion of albumin, erythrocyte and platelet, and hydration. The patient was monitored in room air without any mechanical ventilation support.

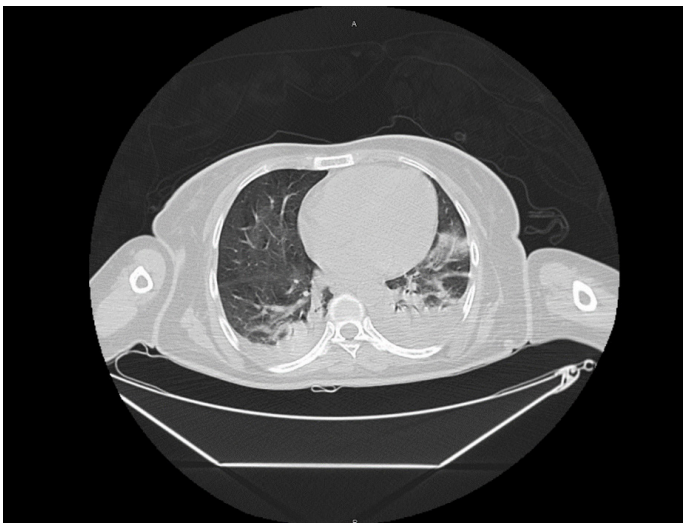

Figure 1. CT scan shows heterogeneous infiltration areas with air bronchograms in the posterobasal region of both lungs and bilateral pleural efussion

An abdominal and thoracal computed tomography (CT) scan were then performed because of her clinical symptoms and signs of septic shock which demonstrated the presence of an aerated left kidney with an extension of gas into the pararenal space and an iliopsoas. Abdominal CT confirmed the diagnosis of Class 3B-EPN according to the Huang and Tseng staging protocols [5]. CT scan in **Figure 1** shows heterogeneous areas of infiltration detected on air bronchograms in the posterobasal region of both lungs and bilateral pleural effusion. Class 3B EPN computed tomographic scans (**Figures 2 a,b and c**) showed left-sided EPN with an extension of gas into the pararenal space at the coronal, sagittal and axial planes, respectively. CT scan in **Figure 3** shows iliopsoas abscess with a craniocaudal dimension of about 70 mm.

Her final hemoglobin A1c (HbA1c) value was 15.5 percent. Urine and blood cultures demonstrated the existence of Escherichia coli. Based upon culture results, the patient was treated with meropenem (1.0 g IV every 8 hours) based on the results of the bacterial susceptibility tests. After the inflammation was relieved, percutaneous catheter drainage (PCD) of the left kidney was performed (**Figure 4**). PCD was not performed since

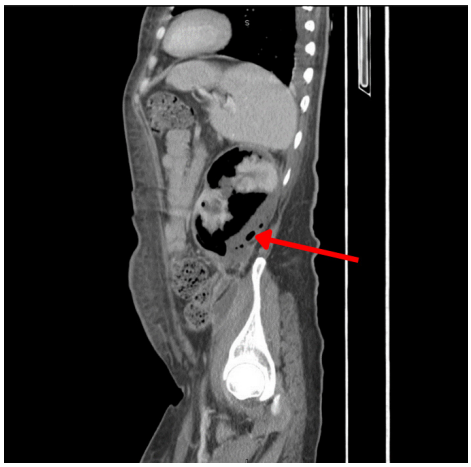

Figure 2a. Class 3B EPN. Computed tomographic scan shows left-sided EPN with extension of gas to the pararenal space at the coronal plane (arrowhead)

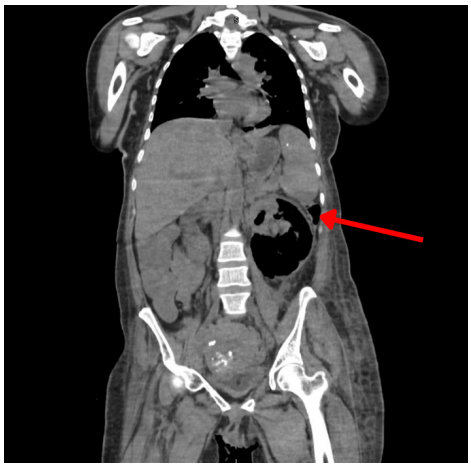

Figure 2b. Class 3B EPN. Computed tomographic scan shows left-sided EPN with extension of gas to the pararenal space at the sagittal plane (arrowhead)

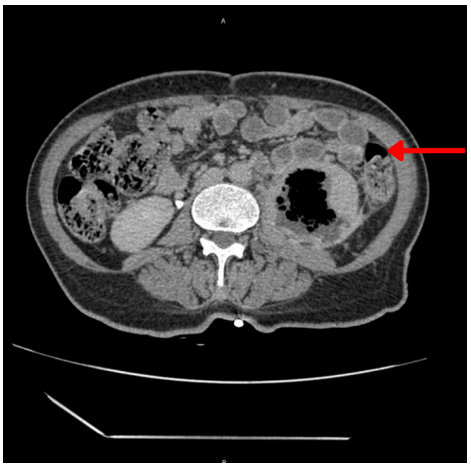

Figure 2c. Class 3B EPN. Computed tomographic scan shows left-sided EPN with extension of gas to the pararenal space at the axial plane (arrowhead)

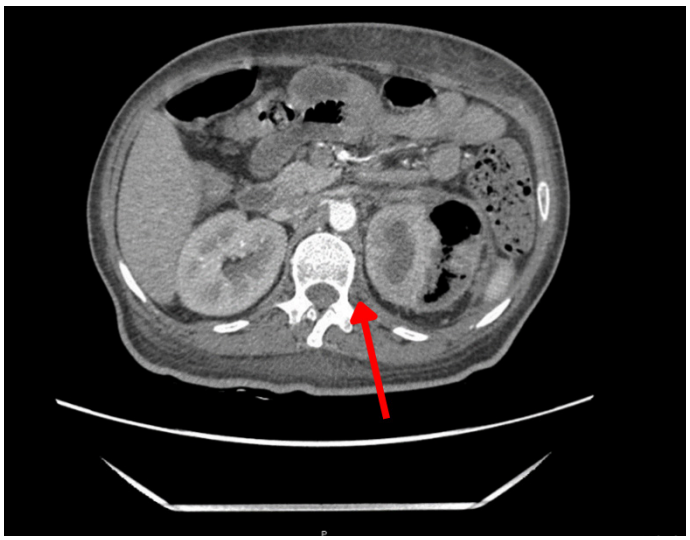

Figure 3. CT scan shows iliopsoas abscess (arrowhead)

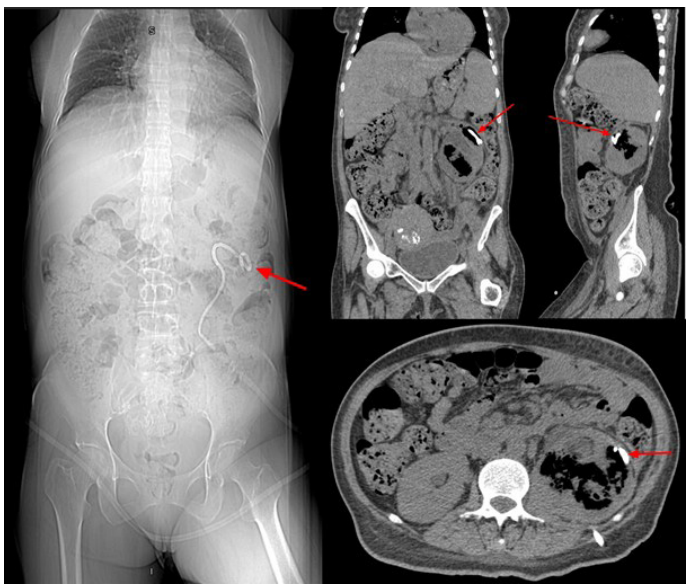

Figure 4. Computed tomographic scan shows left sided drainage catheter image (arrowhead)

IPA couldn't be localized precisely for penetration.

She was treated for 6 weeks with intravenous meropenem which resulted in a partial recovery without any further relapses. Repeated blood and urine cultures were devoid of bacterial colonization, but the activity of adenosine deaminase (ADA) measured from PCD fluid samples was much higher than normal (ADA: 565 IU/L; range: 0-30 IU/L). After PCR identified mycobacteria based on cultures of PCD and urine samples, empirical treatment with isoniazid (300 mg/day), rifampicin (600 mg/day), pyrazinamide (30 mg/kg/day) and ethambutol (400 mg/day) were started as a conventional antituberculosis treatment procedure. Mycobacterium tuberculosis was identified in acid-fast bacillus polymerase chain reaction (AFB-PCR) of the PCD sample. As for the mixed infection, PCD and urine cultures had no growth of pyogenic agents. Based on phenotypic drug susceptibility testing (DST), resistance to isoniazid and rifampicin was not detected.

Discussion

EPN is known as a serious infection of the renal parenchyma caused by the gas-producing pathogenic bacteria which may lead to necrosis. The most frequent pathogen that causes EPN is Escherichia coli. Majority of the patients (70%) suffering from EPN exhibit a history of DM. High blood glucose levels in patients having poorly controlled DM can provide a nourishing environment for the gas-forming bacteria. Improved glycemic control was shown in 72% of the patients with type 1 diabetes based on observational data compiled from 33 studies conducted during the pandemic period. An average drop of 0.05% in HbA1c levels was observed during the pandemic period, with an average increase of 3.75% still within the reference range during glucose monitoring. On the other hand, a deterioration in glycemic control was observed in almost half of the studies performed in patients with type 2 DM with an average increase of 0.14% in HbA1c levels [6]. In another study DM was not associated with mortality [7]. Similarly, poorly controlled type 2 DM in our case, fostered the development of EPN causing septic

shock and DKA which might have led to development of fatal consequences.

IPA is a rarely seen pathological condition with various patterns of symptomatology and etiology. Seldomly identified clinical features are urinary tract infections such as renal abscess, perinephric abscess, and EPN complicated by IPA. IPA may exist as a primary psoas abscess originating from an infected lymphogenic or hematogenous location, or more prevalently as a secondary psoas abscess stemming from a nearby location such as the urinary system. As in the case of EPN, common causative microbiological agents are gram-negative bacteria, such as Escherichia coli and Bacteroides species [8]. A common first-line treatment avaliable in the literature is the use of broad-spectrum antibiotics, such as quinolones and cephalosporins which also provide antibacterial coverage over any possible primary sources. Once the results of the microbiological culture are available, the antibiotics should be prescribed according to the type and individual sensitivities of the identified pathogen(s) [9].

CT scanning is the most reliable and sensitive diagnostic modality for EPN because it reveals the gas distribution patterns in the kidneys. Imaging is essential to managing the disease in order to make an early diagnosis and to avoid a potentially devastating outcome. Although the first- line treatment was assumed to be the use of antibiotics, PCD is the second most important treatment approach.

The literature reports that many small abscesses can be treated with antibiotics alone and the majority of those requiring drainage can be effectively aspirated under CT guidance. After drainage, the antibiotherapy should be selected according to the microorganism(s) to be isolated [8,10]. A higher mortality risk may be associated with an antibiotherapy alone when compared with the additional interventions employed such as percutaneous drainage of the abscess [11]. In some cases such as class 3B or 4 EPN patients, a delayed elective nephrectomy is also preferred as a salvage procedure [12].

Atypical microbial agents should always have to be considered in cases where inadequate response to the treatment is obtained. Inadequate clinical and radiological response despite a 6-week treatment with wide spectrum antibiotics in our case might be attributed to the TB infection diagnosed.

Generally, TB is the most common cause of death from infectious diseases worldwide. Renal TB is known as the second most common extrapulmonary form of TB. Renal TB often exists with nonspecific symptoms such as pyuria, dysuria, fever, weight loss, and flank pain. Renal involvement with TB is usually overlooked in many cases. Most patients with renal TB have sterile pyuria, which can be accompanied by microscopic hematuria. In cases where a common bacterial infection does not exist, the urinary tract TB is diagnosed by identifying pyuria. Urogenital TB should be treated with antituberculosis therapy. Generally, the same procedure used for the pulmonary TB is employed in such patients. Increased urinary concentrations of antituberculosis agents are observed which provide a cure rate of over 90 percent. Usually after two weeks of appropriate antituberculosis therapy no bacilli are virtually detectable in the urine. Especially for those patients with hydronephrosis and pyelonephritis, an early PCD is a reasonable option whose optimal duration is debatable. Relapse of urogenital TB can be observed after initial sterilization of urine with a rate of up to 6 percent of the cases after an average of 5 years of treatment. However, relapse rates among patients who require nephrectomy seem to be rather low (<1%). Surgical interventions for the treatment of urogenital TB include nephrectomy for patients with nonfunctioning kidney, extensive disease involving the whole kidney associated with hypertension, ureteropelvic junction obstruction and coexisting renal carcinoma. Sometimes autonephrectomy may develop after long-term follow up [13,14]. Although PCD was maintained over the second month of the antituberculosis treatment, no detectable radiological regression was observed in our case. A slight deterioration in renal functions seems to indicate a plausible renal loss in the long term.

Finally, recent data have shown that hypoalbuminemia, shock as an initial presentation, bacteremia, indications for hemodialysis and polymicrobial infection represent prognostic factors for mortality in patients with EPN. The existence of more than two of these prognostic factors pose the highest risk of mortality which require timely diagnosis and aggressive management [15]. In cases where no adequate response is received to the long-term therapy, Mycobacterium tuberculosis should always have to be kept in mind as a possible microbial agent especially in developing countries.

Delayed diagnosis of many diseases due to the COVID-19 pandemic as a result of superposition of different clinical states may end up with mortal consequences especially in more complicated cases. Therefore, such complicated cases should have to be examined more carefully by systematic evaluation of laboratory and radiological findings since the renal TB is a slowly progressing asymptomatic disease.

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References

[1] Dahnert W. Radiology Review Manuel. 6ht Edition, Philadelphia. Lippincott Williams and Wilkins press; 2007.

[2] Deoraj S, Zakharious F, Nasim A, Missouris C. Emphysematous pyelonephritis: outcomes of conservative management and literature review. BMJ Case Rep 2018:bcr2018225931. https://doi.org/10.1136/bcr-2018-225931.

[3] Daher Ede F, da Silva GB Jr, Barros EJG. Renal Tuberculosis in the Modern Era. Am J Trop Med Hyg 2013;88:54-64. https://doi.org/10.4269/ajtmh.2013.12-0413.

[4] Taha D-E, Raheem AA, Aljarbou A, Haresy MY, Alrubat A, Alowidah I. Concurrent bilateral emphysematous pyelonephritis and secondary iliopsoas abscess extending to thigh muscles with profuse rectal bleeding. A rare case scenario. Int J Surg Case Rep 2021;86:106289. https://doi.org/10.1016/j.ijscr.2021.106289.

[5] Huang JJ, Tseng CC. Emphysematous pyelonephritis: clinicoradiological classification, management, prognosis, and pathogenesis. Arch Intern Med 2000;160:797-805. https://doi.org/10.1001/archinte.160.6.797.

[6] Eberle C, Stichling S. Impact of COVID-19 lockdown on glycemic control in patients with type 1 and type 2 diabetes mellitus: a systematic review. Diabetol Metab Syndr 2021;13:95. https://doi.org/10.1186/s13098-021-00705-9.

[7] Dutta P, Bhansali A, Singh SK, Gupta KL, Bhat MH, Masoodi SR, et al. Presentation and Outcome of Emphysematous Renal Tract Disease in Patients with Diabetes Mellitus. Urol Int 2007;78:13-22. https://doi.org/10.1159/000096929.

[8] López VN, Ramos JM, Meseguer V, Pérez-Arellano JL, Serrano R, García-Ordóñez MÁ, et al. Microbiology and Outcome of Iliopsoas Abscess in 124 Patients. Medicine (Baltimore) 2009;88:120-30. https://doi.org/10.1097/MD.0b013e31819d2748.

[9] Saadi A, Ayed H, Bouzouita A, Cherif M, Kerkeni W, Selmi S, et al. Results of conservative management of emphysematous pyelonephritis. Nephrol Ther 2016;12:508-15. https://doi.org/10.1016/j.nephro.2016.05.007.

[10] Yacoub WN, Sohn HJ, Chan S, Petrosyan M, Vermaire HM, Kelso RL, et al. Psoas abscess rarely requires surgical intervention. Am J Surg 2008;196:223-7. https://doi.org/10.1016/j.amjsurg.2007.07.032.

[11] Somani BK, Nabi G, Thorpe P, Hussey J, Cook J, N'Dow J, et al. Is Percutaneous Drainage the New Gold Standard in the Management of Emphysematous Pyelonephritis? Evidence From a Systematic Review. J Urol 2008;179:1844-9. https://doi.org/10.1016/j.juro.2008.01.019.

[12] Alsharif M, Mohammedkhalil A, Alsaywid B, Alhazmy A, Lamy S. Emphysematous pyelonephritis: Is nephrectomy warranted? Urol Ann 2015;7:494-8. https://doi.org/10.4103/0974-7796.158503.

[13] Muneer A, Macrae B, Krishnamoorthy S, Zumla A. Urogenital tuberculosis-epidemiology, pathogenesis and clinical features. Nat Rev Urol 2019;16:573-98. https://doi.org/10.1038/s41585-019-0228-9.

[14] Çek M, Lenk S, Naber KG, Bishop MC, Johansen TEB, Botto H, et al. EAU Guidelines for the Management of Genitourinary Tuberculosis. Eur Urol 2005;48:353-62. https://doi.org/10.1016/j.eururo.2005.03.008.

[15] Lu Y-C, Chiang B-J, Pong Y-H, Chen C-H, Pu Y-S, Hsueh P-R, et al. Emphysematous pyelonephritis: Clinical characteristics and prognostic factors. Int J Urol 2014;21:277-82. https://doi.org/10.1111/iju.12244.