Ksenija Mijović1, Nevena Stanišić1, Dragan Mašulović1,2, Dušan Šaponjski1, Nikola Bogosavljević2, Dragan Vasin1, Milica Mitrović Jovanović1

1 Univerzitetski klinički centar Srbije, Centar za radiologiju i magnetnu rezonancu, Beograd, Srbija
2 Univerzitet u Beogradu, Medicinski fakultet, Srbija
3 Institut za ortopediju “Banjica”, Beograd, Srbija

OHUSKI NALAZ PNEUMOMEDIJASTINUMA KAO RETKE KOMPLIKACIJE EMFIZEMATOZNOG PIJELONEFRITISA

SAŽETAK

Uvod: Emfizematozni pijelonefritis je retka, akutna i životnog ugrozavajuća nekrotizirajuća infekcija bubrega, uzrokovana fakultativno anaerobnim bakterijama, koje produkuju gas, kao što su Escherichia coli, Klebsiella i Proteus, a javlja se najčešće kod pacijenata koji boluju od diabetes mellitus-a. Pneumomediastinum je redak nalaz u ovom oboljenju, ali uz odgovarajuće kliničke i laboratorijske nalaze, kod pacijenata sa radiološkim nalazom pneumomediastinuma, potrebno je posumnjati i na eventualno postojanje emfizematoznog pijelonefritisa.

Prikaz bolesnika: Prikazujemo slučaj pacijentkinje srednjeg životnog doba, sa simptomima i laboratorijskim nalazima koji ukazuju na infekciju, bubrežnu insuficijenciju i hiperlglikemiju, a koja se lečila od diabetes mellitus-a. Radiološkim pregledima je dijagnostikovana izražena i udubljenih izražena infekcija bubrega, sa destrukcijom parenhima i intraparenhimalnim gasovima, koje su propagirale u perirenalni i pararenalni prostor. Postavljena je dijagnoza emfizematoznog pijelonefritisa, a radiološkim vidljivim elementima sa pneumomediastinuma.

Zaključak: Pneumomediastinum je redak nalaz u ovom oboljenju, ali uz odgovarajuće kliničke i laboratorijske nalaze, kod pacijenata sa radiološkim nalazom pneumomediastinuma, potrebno je posumnjati i na eventualno postojanje emfizematoznog pijelonefritisa. U praksi, pacijentkinja je podvrgnuta hitnom operativnom lečenju, pri čemu je učinjena levostrana nefrektomija. Uprkos brzom i iscrpnim tretmanu, pacijentkinja je došla u smrtni ishod u postoperativnom periodu.

Ključne reči: infekcija bubrega, pneumomediastinum, pneumomediastinum

ABSTRACT

Introduction: Emphysematosus pyelonephritis is a rare, acute, and life-threatening necrotizing renal infection caused by gas-producing facultative anaerobes, such as Escherichia coli, Klebsiella, and Proteus, most commonly in the setting of underlying diabetes mellitus. Pneumomediastinum is a rare imaging finding in this disease, and a high index of suspicion is required for diagnosing emphysematosus pyelonephritis in patients presenting with pneumomediastinum, in the right clinical setting.

Case presentation: We present the case of a middle-aged female patient with symptoms and laboratory findings indicating infection, renal failure, and hyperglycemia, and a personal history of diabetes mellitus. The imaging procedures revealed findings of a severe and advanced necrotizing renal infection with parenchymal destruction and intraparenchymal gas collections extending into the perirenal and pararenal spaces. We established the diagnosis of emphysematosus pyelonephritis accompanied by perirenal abscess formation and pneumoretroperitoneum, with gas collections propagating into the mediastinum. In the setting of such a severe form of infection, the patient underwent immediate surgery with left nephrectomy. Despite prompt and intensive treatment, the patient unfortunately succumbed to the disease during the postoperative period.

Conclusion: Pneumomediastinum is a rare complication of retroperitoneal processes, and, when present, indicates their extensiveness, often being an ominous prognostic sign. By presenting this case, we aim to highlight the severity of this form of renal infection and the unequivocal need for immediate response, as well as to emphasize the significance of imaging findings, which are somewhat unusual, but should raise suspicion of an insidious and serious retroperitoneal infection.

Key words: renal infection, pneumoretroperitoneum, pneumomediastinum

Corresponding author: Ksenija Mijović
Center for Radiology and Magnetic Resonance Imaging, University Clinical Center of Serbia
2 Pasterova Street, 11000 Belgrade, Serbia
E-mail: mijovicksenija@gmail.com

DOI: 10.5937/3-35705

108 Mart 2022. | Volumen 3 / Broj 1 | SRPSKI MEDICINSKI ČASOPIS LEKARSKOE KOMORE
INTRODUCTION

Emphysematous pyelonephritis (EPN) is a rare, acute, and life-threatening necrotizing renal disease defined as necrotizing infection with gas particles within the renal parenchyma, the kidney collecting system, or in the perirenal space [1]. It mainly occurs in patients with uncontrolled diabetes mellitus and is more frequent in women. It is most commonly caused by gram-negative facultative anaerobes, such as E. coli, Klebsiella, and Proteus [2].

The disease may be asymptomatic, or it may present with nonspecific symptoms, such as generalized fatigue, fever, lower back pain, or it may imitate intestinal obstruction and GI tract perforation and, combined with nonspecific laboratory test results, the result is that diagnosis is often established late [3,4,5]. Computerized tomography (CT) is the most reliable method for establishing a timely diagnosis, evaluating the distribution of gas inclusions and fluid, as well as for monitoring the course of the disease [6].

CASE PRESENTATION

A 56-year-old female patient presented at the Emergency Clinic of the University Clinical Center of Serbia with symptoms of extreme fatigue, accompanied by fever, dyspnea, and obstipation. These symptoms had been present the previous 7 days. Laboratory findings showed leukocytosis (26 x 10⁹/l) with neutrophilia (88.6%), a high level of C-reactive protein (280.6 mg/l), a very high level of procalcitonin (49.2 ng/ml), elevated levels of nitrogenous substances: urea – 29.7 mmol/l and creatinine – 286 μmol/l, as well as normoglycemia and normal insulin. Among chronic diseases, diabetes was noted in the anamnesis.

Native radiography of the abdomen showed a pneumoperitoneum, as well as a pneumomedial aspect of the left kidney, with a fluid level (Figure 1). Ultrasound of the abdomen showed a large amount of gas in the left retroperitoneal space, which limited the visualization of the left kidney. The computed tomography findings showed leukocytosis (26 x 10⁹/l) with neutrophilia (88.6%), a high level of C-reactive protein (280.6 mg/l), a very high level of procalcitonin (49.2 ng/ml), elevated levels of nitrogenous substances: urea – 29.7 mmol/l and creatinine – 286 μmol/l, as well as normoglycemia and normal insulin.

Figure 1. Axial CT section at the left kidney upper pole level demonstrating an abscess formation in the posterior mediastinum, with an air-fluid level.

Slika 1. Aksijalni presek CT pregleda u nivou gornjeg pola levog bubrega prikazuje apsesnu kolekciju u posteromedijalnom aspektu, sa hidroaeričnim nivoom.
well as extreme hyperglycemia, even after insulin administra-
tion. In her anamnesis, the patient stated diabetes as a chronic disease.

Native radiography of the abdomen showed signs of extraluminal gas, in the form of pneumoperitoneum, while abdominal ultrasonography showed a large amount of gas in the left retroperitoneal space, which limited the visibility of the left kidney. The computerized tomography (CT) finding showed an enlarged left kidney, with a disintegrated parenchyma, within which small circular and linear gas inclusions were visible that extended into the perirenal space, in whose posterior-medial aspect an abscess formation with an air-fluid level was also visible (Figure 1). The complete finding indicated the existence of EPN. Gas inclusions were also visible in the left retroperitoneal space, as well as in the psoas muscle, with extensions into the musculature of the left coxofemoral joint. Inclusions of free gas were also visible contralaterally in the anterior pararenal space, precavally, with retrocrural extension into the mediastinum (Figure 2). Further superior extension of gas inclusions reached the level of the superior thoracic aperture presenting the radiological finding of pneumomediastinum (Figures 3 and 4).

The intraoperative finding in our patient revealed complete parenchymal destruction in the left kidney, which is why total left nephrectomy was performed. The pathohistological finding showed chronic
bubrega, usled čega je urađena totalna levostранa nefrektomija. Patohistološki nalaz je pokazao hronični pijelonefritis i perinefritis sa akutnom purulentnom egzacerbacijom i formiranjem apscesa, uz hemoragične infarkte parenhima. Pacijentkinja je, nažalost, podlegla bolesti u postoperativnom toku.

DISKUSIJA

Predstavljamo slučaj EPN-a sa pneumoretroperitoneum i pneumomediastinum, što predstavlja retku komplikaciju. Retroperitoneum, medijastinum i subkutana tkiva su u kontinuitetu i međusobno komuniciraju, povezana fascijalnim prostorima duž kojih se prostru veliki krvni sudovi i vlakna dijafragme, što omogućava slobodnom gasu nastalom u bilo kojoj od ovih regija da nesmetano propagira u drugu regiju. Tako, retroperitonealni gas, nastao usled infekcije bakterijama koje produkuju gas, može dosegnuti medijastinum i subkutano tkivo sa nastankom pneumomediastinuma i subkutanog emfizema [7,8], što je i bio slučaj sa našom pacijentkinjom (Slika 5).

Based on gas inclusion distribution and the degree of involvement of the kidney, EPN has been classified into three classes:

- Class 1: gas in the kidney collecting system
- Class 2: gas in the kidney parenchyma
- Class 3a: gas propagation into the perirenal space
- Class 3b: gas propagation into the pararenal space
- Class 4: bilateral EPN or the only kidney with EPN [9].

Based on this classification, our patient was categorized as Class 3b.

Mortality is high and may be as high as 80% in the absence of a surgical procedure [2]. When the parenchyma of the kidney is preserved, initial treatment is conservative, with possible percutaneous drainage or ureteral stenting. In case of diffuse and advanced infection with extensive parenchyma destruction, the indication for urgent surgery becomes quite clear [8].

EPN is a life-threatening infection caused by gas-producing microorganisms, which most commonly requires nephrectomy, and which may be complicated by propagation of gas inclusions along extraperitoneal tissues, rarely reaching the mediastinum. Therefore, the finding of pneumomediastinum of unknown cause with a certain clinical presentation warrants the inclusion of EPN into the differential diagnosis. As far as we could find, by researching available literature, pneumomediastinum is a rare complication of EPN and it correlates with an advanced stage of disease.

Conflict of interest: None declared.
Na osnovu distribucije gasnih inkluzija i zahvaćenosti bubrega, EPN je klasifikovan u četiri klase:
Klasa 1: gas u sabirnom sistemu bubrega
Klasa 2: gas u pararenalnom prostoru
Klasa 3a: propagacija gasa u perirenalni prostor
Klasa 3b: propagacija gasa u pararenalni prostor
Klasa 4: bilateralni EPN ili jedini bubreg sa EPN-om [9].

Na osnovu ove klasifikacije, naša pacijentkinja je svrstana u Klasu 3b.

Mortalitet je visok, i može iznositi i do 80% bez hirurške intervencije [2]. Kada postoji očuvan parenhim bubrega, inicijalna terapija je konzervativna, eventualno sa perkutanom drenažom ili plasiranjem ureteralnih stentova. U slučaju difuzne i uznapredovale infekcije sa ekstenzivnom destrukcijom parenhima, indikacija za urgentnu hirurgiju postaje jasna [8].

EPN je životno ugrožavajuća infekcija uzrokovana mikroorganizmima koji produkuju gas, koja najčešće zahteva nefrektomiju, a koja se može komplikovati propagacijom gasnih inkluzija duž ekstraperitonealnih tkiva, retko dosežući medijastinum. Zbog toga, nalaz pneumomedijastinuma nepoznatog uzroka sa odgovarajućom kliničkom prezentacijom zahteva uključivanje EPN-a u diferencijalnu dijagnozu. Koliko smo mi saznavali pretraživanjem dostupne literature, pneumomedijastinum je retka komplikacija EPN-a i korelira sa uznapredovalim stadijumom bolesti.

Sukob interesa: Nije prijavljen.

LITERATURA / REFERENCES
1. Misgar RA, Mubarik I, Wani AI, Bashir MI, Ramzan M, Laway BA. Emphysematous pyelonephritis: A 10-year experience with 26 cases. Indian J Endocrinol Metab. 2016 Jul-Aug;20(4):475-80. doi: 10.4103/2230-8210.183475.
2. Lu YC, Hong JH, Chiang BJ, Pong YH, Hsueh PP, Huang CY, et al. Recommended Initial Antimicrobial Therapy for Emphysematous Pyelonephritis: 51 Cases and 14-Year-Experience of a Tertiary Referral Center. Medicine (Baltimore). 2016 May;95(21):e3573. doi: 10.1097/MD.00000000000003573.
3. Xing ZX, Yang H, Zhang W, Wang Y, Wang CS, Chen T, et al. Point-of-care ultrasound for the early diagnosis of emphysematous pyelonephritis: A case report and literature review. World J Clin Cases. 2021 Apr 16;9(11):2584-94. doi: 10.12998/wjcc.v9.i11.2584.
4. Chuang PH, Yii CY, Cheng KS, Chou JW, Chen CK, Lin YN. Emphysematous pyelonephritis concurrent with psosas muscle abscess. Intern Med. 2011;50(22):2859-60. doi: 10.2169/internalmedicine.50.6117.
5. Yeung A, Cheng CH, Chu P, Man CW, Chau H. A rare case of asymptomatic emphysematous pyelonephritis. Urol Case Rep. 2019 Jul 26;26:100962. doi: 10.1016/j.eucr.2019.100962.
6. Sun JN, Zhang BL, Yu HY, Wang B. Severe emphysematous pyelonephritis mimicking intestinal obstruction. Am J Emerg Med. 2015 Dec;33(12):1846.e3-6. doi: 10.1016/j.ajem.2015.04.041.
7. Wang YC, Wang JM, Chow YC, Chiu AW, Yang S. Pneumomediatinum and subcutaneous emphysema as the manifestation of emphysematous pyelonephritis. Int J Urol. 2004 Oct;11(10):909-11. doi: 10.1111/j.1442-2042.2004.00919.x.
8. Kourounis G, Lim QX, Rashid T, Gurunathan S. A rare case of simultaneous pneumoperitoneum and pneumomediatinum with a review of the literature. Ann R Coll Surg Engl. 2017 Nov;99(8):e241-3. doi: 10.1308/rcsann.2017.0165.
9. Mongha R, Bantu B, Ranjit DK, Anup KK. Emphysematous pyelonephritis – case report and evaluation of radiological features. Saudi J Kidney Dis Transpl. 2009 Sep;20(5):838-41.