

Case Report

Portal Vein Gas in a Diabetic Patient with Gas-forming Pararenal Abscess

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The incidence of portal vein gas (PVG), which used to be an ominous sign of intestinal sepsis, has increased with progressive improvements in imaging modalities. Therefore, the clinical significance of PVG has changed. Emphysematous pyelonephritis (EPN) is a rare, potentially life-threatening and gas-forming infection of the renal parenchyma and/or its surroundings. Gas-forming pararenal abscess presenting with PVG is even rarer. We hereby present the case of a diabetic female with poor glycemic control, who was diagnosed to have EPN and PVG concurrently by computed tomography. She underwent percutaneous catheter drainage (PCD) of the pyelonephritis. Both cultures of blood and pus grew *Klebsiella pneumoniae*. Her subsequent clinical course was uneventful. In summary, EPN is a rare but potentially fatal urinary tract infection in diabetic patients, and finding PVG on computed tomography can aid in diagnosis. Conservative treatment with intravenous antibiotics and PCD of pus may be adequate for the patient with EPN. However, nephrectomy may be necessary if the patient deteriorates and PCD fails to contain the infection. [*Hong Kong J Nephrol* 2007;9(1):41–4]

Key words: diabetes mellitus, emphysematous pyelonephritis, pararenal abscess, percutaneous catheter drainage, portal vein gas

門靜脈氣體 (portal vein gas, PVG) 曾是腸道敗血症的惡兆，現因影像技術的進展而發現率增加，所以 PVG 的臨床意義已有所改變；氣腫性腎盂腎炎 (emphysematous pyelonephritis, EPN) 是一少見具生命威脅性的產氣急性腎臟感染和/或其週邊組織，須要作積極的處理。我們在此報告一少見的糖尿病女性病例，其血糖控制不良；因腰脇痛和腹部不舒服二個月以及最近有發燒和血小板減少現象而轉至本院。電腦斷層攝影檢查發現患者同時有 PVG 和產氣性腎旁膿瘍，就接受經皮導管引流術抗生素和保守療法，其血液和膿液中長出克雷伯氏肺炎菌，後平順出院。我們應知悉 PVG 臨床意義之改變以及產氣性腎 (旁) 膿瘍的診斷、分類和治療其方式，採取較為保守的療法 (如：嚴格控制血糖、抗生素靜注和經皮導管引流術)，也可以治癒此一罕見合併有 PVG 之 EPN 病例。

INTRODUCTION

Portal vein gas (PVG) was first reported in an infant who died of abdominal catastrophe by Wolfe and Evans in 1955 [1] and in adults by Susman and Senturia in 1960 [2]. In the past, immediate laparotomy was mandatory if there was presence of PVG. The increasing utility of computed tomography (CT) and Doppler ultrasound has allowed early detection of PVG. The

presence of PVG has been noted in many patients with various clinical courses in whom laparoscopy may not be necessary. The significance of PVG must be individualized by clinical condition. Since there is no previous report of PVG in a patient with emphysematous pyelonephritis (EPN) or gas-forming peri-/pararenal abscess, we hereby present a diabetic case and discuss the possible mechanisms and clinical significance of PVG in a diabetic patient with EPN.

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CASE REPORT

A 31-year-old female was diagnosed with gestational diabetes mellitus in 1996 and treated with a controlled diet only. She was then lost to follow-up in the outpatient clinic. She complained of intermittent bilateral flank pain and abdominal discomfort within the recent 2 months. She visited a local hospital, and pyuria was noted. Abdominal CT showed left-sided acute bacterial nephritis (ABN), Group II (i.e. acute lobar nephronia) (Figure 1) [3] and left-sided gas-forming anterior pararenal abscess with air–fluid level. Highly suspected EPN Class III_B (pararenal involvement) and PVG (Figure 2) were diagnosed.

She was referred to our emergency room on April 11, 2005. On physical examination, she was fully conscious, blood pressure was 107/72 mmHg, heart rate was 132/minute, and body temperature was 39°C. Mild tenderness over bilateral flanks was found. Follow-up CT showed no perforation (free gas) of the gastrointestinal tract. Also, no bowel wall thickening and absence of gas within the superior mesenteric vein were noted. Hemogram showed a leukocyte count of 7,200/mm³, hemoglobin of 12.6 g/dL, platelet count of 70,000/mm³, postprandial glucose of 27.6 mmol/L, glycosylated hemoglobin (HbA1C) of 10.9%, and blood ketone (++) . Routine urinalysis revealed protein, (+); glucose, ≥ 155 mL/L; red blood cell count, 0–1/high power field (HPF); white blood cell count, 7–10/HPF; and no azotemia.

The patient underwent percutaneous catheter drainage (PCD) of left-sided gas-forming pararenal abscess immediately and was administered

intravenous ciprofloxacin, metronidazole, and third generation cephalosporin. Fever subsided 2 days later. No obvious wound oozing was found. A total amount of 410 mL pus was drained out from the percutaneous catheter in the first week. Both cultures of blood and pus grew *Klebsiella pneumoniae*, but urine culture yielded no growth. Stool routine for occult blood and pus cells was negative. Also, lower gastrointestinal series showed normal findings. Just before discharge, follow-up CT showed that the pyelonephritis (ABN) had resolved and both kidneys were intact (Figure 3). The percutaneous catheter was removed, and the patient attended regular follow-up at our nephrology clinic.



Figure 2. Abdominal non-contrast computed tomography shows the presence of portal vein gas in the left hepatic and caudate lobes (white arrows). The spleen is enlarged.



Figure 1. Abdominal enhanced computed tomography shows left-sided anterior pararenal abscess (white arrows) with air–fluid level, which is characteristic of EPN Class III_B and Type 2 (wet). An ill-defined hypodense mass (i.e. acute bacterial nephritis) can also be seen (black arrows).

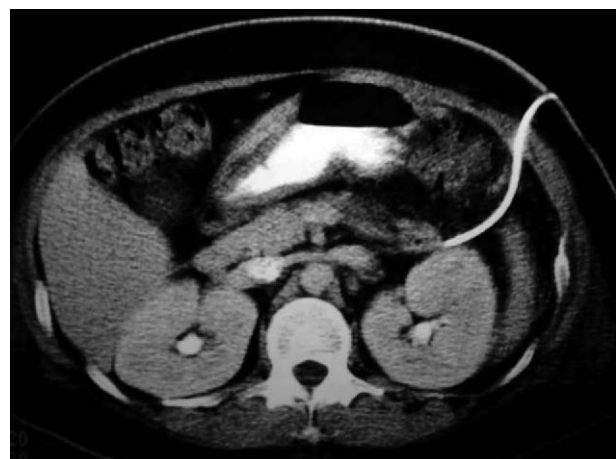


Figure 3. Follow-up abdominal computed tomography shows that the pyelonephritis (acute bacterial nephritis) has resolved and both kidneys are intact, with the percutaneous catheter *in situ* (anterior pararenal space).

DISCUSSION

The presence of PVG in necrotic bowel (72%) is associated with a high mortality of up to 75% [4]. In the past, the diagnosis of PVG in conventional radiography was regarded as an indication for surgical exploration. With advances in imaging techniques, the frequency of detection of PVG has increased [5]. The close association of PVG with poor prognosis has changed and should be re-evaluated. In 1997, Hong et al suggested that criteria for surgical intervention of PVG should be individualized and that laparotomy is not mandatory [6].

The mechanism for the formation of PVG is not clear. The most common cause of PVG is bowel ischemia, which permits the passage of intraluminal air into the portal venous system [7]. The causes of bowel ischemia include arterial and venous mesenteric thrombosis, aortic dissection, and hypoperfusion associated with non-occlusive mesenteric disease [8]. In addition, bowel distension can produce the minimal mucosal disruption that allows intraluminal gas to be intravascular, which may be caused by endoscopic retrograde cholangiopancreatography [9], enema [10], ileus [11], or blunt injury [12]. Intra-abdominal sepsis with PVG has also been reported, including diverticulitis [13], liver abscess [14], and abdominal tuberculosis [15]. The pathogenesis of PVG in intra-abdominal sepsis may be septicemia in the branches of the mesenteric and portal vein (i.e. pylephlebitis) and intraluminal fermentation of carbohydrates by bacteria [16], as in our case.

EPN is a rare, potentially life-threatening and gas-forming infection of the renal parenchyma and/or its surroundings [17]. We hypothesize that high tissue glucose levels in diabetic patients may provide gas-forming *Enterobacteriaceae* (such as *Escherichia coli* and *Klebsiella pneumoniae*) with a microenvironment more favorable for their growth and rapid catabolism, which can cause the massive production of gas by mixed acid fermentation or the fermentation of necrotic tissue resulting in expansion of gas chamber and rupture into surrounding tissue or blood stream [18–21]. In this patient, abdominal CT showed no evidence of bowel ischemia or other abdominal lesion. Therefore, we can infer that PVG may be related to EPN, a kind of retroperitoneal sepsis. In 1996, Wan et al concluded that mortality from EPN type 1 (dry or ischemic form, 36%) is higher (3×) than that from type 2 (wet or pus form, 12%) [22]. EPN with a more benign manifestation (i.e. with < 2 risk factors, including thrombocytopenia, acute renal failure, disturbance of consciousness, and shock), treatment with PCD for perinephric gas/pus, concomitant use of intravenous antibiotics, and strict control of blood glucose should be adequate [17].

Follow-up abdominal CT in our patient demonstrated the resolution of both EPN and PVG. However, more extensive EPN (Class 3 or 4) may require immediate nephrectomy [17].

In brief, we presented a diabetic case of gas-forming pararenal abscess with urosepsis (*Klebsiella pneumoniae*). The definite diagnosis of EPN and PVG was made by abdominal CT and cultures of blood and pus. After tight control of blood glucose, intravenous antibiotics, and PCD, her clinical course was uneventful. Unnecessary laparotomy can be avoided if the underlying cause of PVG can be delineated.

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