Gas-Forming Pyogenic Liver Abscess: A Case Report

Yu-Chuang Chu¹, Yuan-Hui Wu¹², Kuang-Chao Tsai¹, Min-Po Ho¹*  

ABSTRACT

Gas-forming pyogenic liver abscess (GPLA), an uncommon and potentially fatal disease, represents 7%-24% of pyogenic liver abscess cases. Diabetes mellitus is a well-known risk factor for pyogenic liver abscess. Here, we present a case of GPLA in a 65-year-old man with diabetic mellitus and hypertension. The patient received computed tomography-guided percutaneous drainage, third generation cephalosporin and insulin control for hyperglycemia. He was discharged 20 days after admission without any complication.

Keywords: pyogenic liver abscess, diabetes mellitus, gas-forming organism

INTRODUCTION

Pyogenic liver abscess (PLA) is uncommon and accounts for 8-25 cases per 100,000 hospital admissions [1,2]. Over the past 2 decades, its case fatality rate has been 11.5 %-40% [2]. Gas-forming PLA (GPLA) is relatively rare and accounts for 7%-24% of all PLA cases [3]. Patients with GPLA are often sicker and have high mortality rates. Most reported cases of GPLA are from the East where the most common pathogen associated with both PLA and GPLA is the Klebsiella spp [3], followed by Escherichia coli and Clostridium spp [4].

CASE REPORT

A 65-year-old male with a medical history of diabetes mellitus and hypertension visited our emergency department with complaints of fever and abdominal pain since past few days. On arrival, all his vital signs were normal but he had tachycardia (122 beats/min). His physical examination revealed mild tenderness in the right upper quadrant of the abdomen, with normal bowel sounds. Blood tests revealed an elevated white blood cell count of 12,400/μL and serum glucose, C-reactive protein, alkaline phosphatase, and aspartate trans-
aminase level of 517 mg/dl, 26.4 mg/dL, 159 U/L, and 126 U/L respectively. An upright chest radiograph revealed gas pockets with air-fluid level in the right upper abdomen (Figure 1, arrow). A contrast-enhanced computed tomography (CT) scan of the abdomen confirmed the presence of a huge gas-forming liver abscess with air-fluid level (Figure 2 A and B, arrows). The patient was treated using CT-guided percutaneous drainage, third generation cephalosporin (ceftriaxone 1 gm q12h for two weeks), and insulin control for hyperglycemia. Blood and pus culture revealed *E. coli*. The patient was discharged 20 days after admission and exhibited good health at 3-month follow-up.

**DISCUSSION**

PLA is uncommon, accounting for 8-25 cases per 100,000 hospital admissions [1,2]. GPLA is uncommon in western countries, and most reported cases of GPLA are from the eastern countries, such as Taiwan [3,5]. *K. pneumoniae* is the most common pathogen, followed by *E. coli* and *Clostridium* spp [4], that cause PLA, especially GPLA, in the Asian population [6,7]. Fever and chills are less frequent in older adults than in younger ones. Atypical clinical features are a possible explanation for absence of fever and chill in older adults with GPLA; thus, physicians, especially emergency physicians, need to be alert for early diagnosis.

![Figure 1. Chest radiograph revealing gas pockets with air-fluid level in the right upper abdomen (arrow).](image1)

![Figure 2 A and B. A contrast-enhanced CT scan of the abdomen revealing a huge gas-forming liver abscess (arrows).](image2)
In older patients with PLA, a several microorganisms can be identified. In addition to *K. pneumoniae*, other polymicrobial causative agents, including *E. coli* and anaerobic bacteria, are more frequently found in older patients [6,8]. Diabetes mellitus, biliary stones, malignancy, liver cirrhosis, and alcoholism are the risk factors for PLA in older adults [6]. The most common co-existing disease was diabetes mellitus (41.9%), followed by biliary stone disorders (32.0%). *K. pneumoniae* is the most frequent causative pathogen of PLA, followed by *E. coli* [8]. Younger individuals were more likely to be male and have alcoholism and a cryptogenic etiology than older adults. On admission, older adults tend to exhibit significantly less tenderness in the right upper abdomen than younger adults [9].

In Taiwan, *K. pneumoniae* is most common pathogen cultured from abscesses, especially gas-forming liver abcess, in patients with diabetes mellitus. Two large case series studies from Taiwan involving 28 and 83 patients with GPLA and non-GPLA, respectively, demonstrated significant differences between two groups [7,10]. These differences were higher incidence of septic shock, bacteraemia, and mortality in patients with GPLA than in those with non-GPLA [7,10]. In total, 101 (77.10%) and 30 (22.90%) cases were due to *K. pneumoniae* and non-*K. pneumoniae* pathogens, respectively. Compared with the non-*K. pneumoniae* cohort, the *K. pneumoniae* cohort demonstrated a significantly higher incidence of underlying diabetes mellitus and more gas-forming abscesses, as demonstrated by sonography and CT examinations [11]. No significant differences in age or gender were observed between patients with KP-PLA and those with non-KP-PLA. KP-PLA was found to be preferentially located in the right hepatic lobe and predominately cryptogenic in origin. Non-KP-PLA commonly develops secondary to underlying hepatobiliary or colorectal diseases, malignancy and intra-abdominal trauma or surgery [12].

Gas-forming liver abscesses are prone to septic shock and rupture. Chou et al. [10] observed septic shock in 32% of patients with gas-forming liver abscesses and in 11% of patients with non-gas-forming liver abscesses. Rupture is also prone to occur because of severe tissue damage and increase in internal pressure due to gas formation. The fatality rate (27–30%) due to gas-forming liver abscess is higher than due to non-gas-forming liver abscess (2–12%) [10,13,14].

Although common presentations of GPLA include fever and abdominal pain, they can be non-specific, resulting in a delayed diagnosis [4]. GPLA can be diagnosed by visualizing gas in the liver parenchyma by hepatic imaging, including ultrasonography, CT scan, and a careful evaluation of abnormal gas patterns on plain abdominal radiographs. Furthermore, CT scan is the most sensitive imaging modality [4]. Air-fluid levels and mottled gas patterns are the most common findings on plain films, but gas formation in the liver parenchyma is reported in only up to 36% of patients with GPLA [3].

The production of gas occurs because of mixed acid fermentation of glucose within the abscess by formic hydrogenlyase, an enzyme that is only produced in an acidic environment when the local pH becomes ≤6 because of acid accumulation. This enzyme converts formic acid accumulated within abscess to carbon dioxide and hydrogen gas [3]. Poor microcirculation in the affected areas has also been postulated to contribute to gas accumulation. This may explain the higher incidence of GPLA
in patients with diabetes mellitus [10]. In general, percutaneous drainage is first-choice treatment because of improvements in imaging and absence of the risk of general anesthesia. Surgical drainage should not be delayed if medical treatment or percutaneous drainage fails or abscess ruptures accompanied by peritonitis [10].

In summary, GPLA still considered a medical challenge because of its complicated clinical course, late diagnosis, and high mortality, especially in older adults with diabetes mellitus. An early diagnosis of this condition, adequate antibiotic administration, and good control of blood glucose with early adequate drainage during hospitalization are crucial for the survival of patients with this critical disease.

REFERENCES

產氣細菌的化膿性肝膿腫：病例報告

瞿裕昌¹，吳元暉¹,²，蔡光超¹，侯民波¹,*

中文摘要

產氣細菌的化膿性肝膿腫被認為是一個非常嚴重的疾病，並具有死亡率很高。它的發生率是化膿性肝膿腫的7%-24%。我們報告一位65歲糖尿病及高血壓患者診斷為產氣細菌的化膿性肝膿腫。該患者接受治療包含斷層掃描引導下經皮穿刺引流術，第三代抗生素並具控制高血糖。患者20天的住院治療後得到改善並且平安出院。

關鍵字：細菌性肝膿腫、糖尿病、產氣性細菌

¹亞東紀念醫院急診醫學部
²輔仁大學醫學系
收稿日期：2017年02月21日
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*通訊作者：侯民波 電子信箱：hominpo@yahoo.com.tw