

Case Report

Extensive accumulation of gas in the portal venous system after chemotherapy of leukemia: a case report

Dongxue Li^{1,2}, Rongpin Wang²

¹Department of Graduate School, Zunyi Medical University, Zunyi, Guizhou, China; ²Department of Radiology, Guizhou Provincial People's Hospital, Guiyang, Guizhou, China

Received May 28, 2018; Accepted August 4, 2018; Epub October 15, 2018; Published October 30, 2018

Abstract: A 28-year-old man was diagnosed with acute lymphocytic leukemia and was then treated with chemotherapy drugs for 9 days. Hepatic portal venous gas (HPVG) was shown through CT scan because of a sudden abdominal pain. The presence of HPVG is a rare finding. It is most commonly caused by bowel necrosis and gas bacteria, which typically carries a grave prognosis. However, a sudden abdominal pain may have been a warning sign. Unfortunately, the patient died after completing the CT scan.

Keywords: Portal veins, chemotherapy of leukemia, necrotizing enteritis

Introduction

HPVG is a sign, rather than an isolated disease. It is related to gastrointestinal diseases and in particular necrotizing enteritis. This is the first case of HPVG caused by chemotherapy of acute lymphoblastic leukemia.

Case report

A 28-year-old man was diagnosed with acute lymphoblastic leukemia by bone marrow puncture after he was found to have a bleeding spot for three months. Laboratory data included a white cell count of $0.7 \times 10^9/L$, hemoglobin of 74.8 g/L, platelets of $13.4 \times 10^9/L$, which were significantly reduced. However, the first CT scan of the abdomen was not abnormal (**Figure 1**) despite sudden abdominal pain coupled with a painful expression, abdominal wall tension, and a suspicious bounce pain. CT was requested again for further evaluation after he received VTLP MDT on the ninth day, which was followed by chills and fever.

CT scan of the abdomen immediately showed the intrahepatic portal vein (**Figure 2**), right ventricle (**Figure 3**), inferior vena cava and splenic vein (**Figure 4**) all of which had a gas shadow to varying degrees. Minimum density projection

(Min-IP) displayed that the portal vein system and mesenteric vein were filled with a wide range of gases (**Figure 5**). The abdominal cavity was also filled with substantial amounts of gas and some segments of small bowel were enlarged (**Figure 6**), especially the jejunum, with thickening of the intestinal wall. Many small bubbles or the thickening of the intestinal wall was found (**Figure 7**). Free gases then spread in the surrounding area of the spleen, under the abdominal wall, and in the left inguinal region (**Figure 8**). Diagnosis of necrotizing enteritis and gastrointestinal perforation was considered. Unfortunately, the patient died after completing the CT scan.

Discussion

Hepatic portal venous gas (HPVG) is a rare condition associated with the disease of the entero-gastritis. It was first reported in 1955 by Wolfe and Evens [1]. Before this report, there have been no documented cases of HPVG associated with acute lymphocytic leukemia. Most previous reports have demonstrated that ischemia or necrosis were the main causes of HPVG [2]. Gas sources included the following contents: (1) Necrotizing enterocolitis or intestinal hypertension caused intestinal gas leakage into the mesenteric vein, (2) Septicemia caused by

Extensive accumulation of gas in the portal venous system



Figure 1. No abnormal density in the liver was detected by admission to CT.

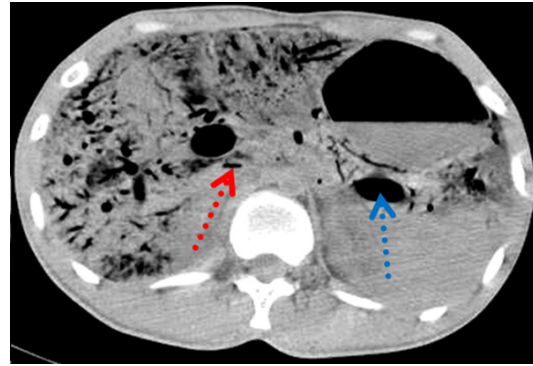


Figure 4. Gas in the inferior vena cava (red arrow) and splenic vein (blue arrow).



Figure 2. In the ninth day of chemotherapy, a large amount of gas was seen in the hepatic portal vein.



Figure 3. Reflection of gas in the right ventricle (arrowhead).



Figure 5. Min-IP showed diffuse gas in portal vein system and mesenteric vein.

infection and gas produced by aerobiogenic microorganisms, and (3) Trauma or iatrogenic loss led to the extracorporeal gas entering the blood vessel. The main causes of HPVG are perforation of the intestinal wall and the pressure of the intestinal cavity. Furthermore, intestinal gas can enter the portal vein system and cause septicaemia.

The diagnosis of HPVG depends mainly on ultrasound and CT [3]. CT examination can not only determine the causes based on its high sensitivity, but also be used for evaluation of curative effect. So it has been used in the diagnosis of HPVG widely. In recent years, with the development of CT reprocessing technology, the detection rate of small amount of HPVG has greatly improved.

In this case, basic disease of the patient was acute lymphoblastic leukemia. Abdominal CT scan revealed the thickening of the intestinal wall and intestinal mucosa, which was the

Extensive accumulation of gas in the portal venous system



Figure 6. The abdominal bowel tube was enlarged and accumulated.



Figure 7. The part of the cavity was thickened and the wall of the intestinal wall was scattered in the gas (arrow).



Figure 8. The left inguinal area was scattered in the gas (arrow).

result of the infiltration of the intestinal wall of leukemia cells. After chemotherapy, leukemic

cells were dissolved and destroyed, which caused the gas to enter the intestinal wall and the abdominal cavity and/or into the portal system. At present, for the bone marrow suppression stage, the patient was very likely to be infected with the intestinal tract after intestinal perforation due to the lack of granulocytes. Additionally, the gas passed through the mesenteric venous fistula into the portal vein system, the inferior vena cava, and the right ventricle. In this case, the extensive venous system gas accumulation was considered as a result of the common causes above. HPVG should be differentiated from the internal gas accumulation in the bile duct on imaging. HPVG is mostly located in the branching gas density shadow which is extended or limited to the subcapsular 2 cm, because of the function of venous blood flow, and the latter is mostly located in the portal area due to the flow of bile [4].

HPVG is a risk signal with high mortality. However, the amount of gas accumulation has no definite relationship with the mortality rate, and its prognosis mainly depends on the primary disease. Therefore, early diagnosis and etiological treatment are key to improving the survival rate and prognosis of HPVG patients. CT examination and post-processing technology is of high value for the diagnosis and etiological diagnosis of HPVG. It is considered to be the gold standard for HPVG diagnosis, providing reliable evidence for clinical diagnosis and treatment.

Disclosure of conflict of interest

None.

Address correspondence to: Rongpin Wang, Department of Radiology, Guizhou Provincial People's Hospital, 83 Zhongshan East Road, Guiyang 550-002, Guizhou, China. E-mail: wangrongpin@126.com

References

- [1] Wolfe JN, Evens WA. Gas in the portal veins of liver in infants: a roentgenographic demonstration with postmortem anatomic correlation. *AJR Am J Roentgenol* 1955; 74: 486-489.
- [2] Wiesner W, Mortelet KJ, Glickman JN, Ji H, Ros PR. Pneumatosis intestinalis and portomesenteric venous gas in intestinal ischemia: correlation of CT findings with severity of ischemia and clinical outcome. *AJR Am J Roentgenol* 2001; 177: 1319-1323.

Extensive accumulation of gas in the portal venous system

- [3] Shah PA, Cunningham SC, Morgan TA, Daly BD. Hepatic gas: widening spectrum of causes detected at CT and US in the interventional era. *Radiographics* 2011; 31: 1403-1413.
- [4] Friedman D, Flancbaum L, Ritter E, Trooskin SZ. Hepatic portal venous gas identified by computed tomography in a patient with blunt abdominal trauma: a case report. *J Trauma* 1991; 31: 290-2.