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Role of Computed tomography in predicting prognosis of Hepatic portal venous gas

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ABSTRACT

BACKGROUND: The aim of this study was to report through 13 cases the particularities of abdominal computed tomography (CT) aspects of hepatic portal venous gas (HPVG) and its correlation with patient prognosis.
METHODS: We analyzed abundance of HPVG and its association with pneumatosis intestinalis (PI) in correlation with fatal outcome using chi-square tests.
RESULTS: Etiologies were mesenteric infarction (n = 5), sigmoid diverticulitis (n = 1), septic shock (n = 1), postoperative peritonitis (n = 1), acute pancreatitis (n = 1), iatrogenic cause (n = 3) and idiopathic after a laparotomy (n = 1). The outcome was fatal in for 6 patients. Abundance of HPV was expressed in total number of hepatic segments involved. The involvement of 3 or more segments was a sensitive sign for lethal outcome with high sensitivity (100%) but it was not specific (50%). Negative predictive value of this sign was 100% ($p \leq 0.005$). Positive predictive value of PI for death was 100% ($p \leq 0.001$).
DISCUSSION: Abundance of HPVG is correlated with prognosis. The presence of PI announces poor outcome Negative predictive value of presence of HPVG in 3 or more segments is interesting. Predicting prognosis with CT can help surgeons to assess the most adequate treatment. Iatrogenic causes are increasingly described after interventional radiology procedures with favorable course.
CONCLUSION: The first etiology radiologists should look for in front of HPVG involving more than 3 hepatic segments and associated with PI is intestinal necrosis which announces a poor prognosis. This study shows that outside of shock situations, HPVG involving 2 or less hepatic segments without PI predicts a good outcome.

1. Introduction

Hepatic portal venous gas (HPVG) is a rare radiological sign, defined by the presence of gas in the portal system. This sign is most often associated with extensive intestinal necrosis. In some cases HPVG can be associated with benign etiologies. Unnecessary exploratory laparotomy should be avoided in these conditions. Nowadays, HVPG is much more easily detected through the routine use of ultrasound and computed tomography (CT). In this cases series, we review the CT manifestations of HPVG and their causes in 13 adults. We focused on the correlation between characteristics of HPVG appearance on CT, etiology and patient prognosis.

2. Patients and methods

The medical records of 13 patients with HPVG or mesenteric venous gas were selected. Seven cases collected over a period of 7 years from January 2008 to January 2015 retrospectively reviewed through the Picture Archiving And Communicating System (PACS) of the radiology department of Mongi Slim university hospital. The search key words were "portal venous gas"; "mesenteric ischemia"; mesenteric infarct"; "pneumatosis intestinalis". Six other cases were prospectively included from two centers (Marsa and Bizerta).

Two scan machines were used. A monoslice SOMATOM plus 4 (Siemens Medical System, Erlanger, Germany) was used from January 2008 to March 2012. A multislice Aquilion 64 (Toshiba medical Systems, Otawara, Japan) was used for the period going from April 2012 to March 2016. Helical CT scans were performed before and after intravenous contrast agent administration using a power injector (80–120 at a rate of 4 ml/s with 35 s scan delay for the arterial phase and 70–80 s for the portal phase). The following

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Table 1
Summary of the clinical history, imaging features and outcomes for all 13 cases of the study.

Case	*Age gender*	*Clinical Symptoms*	*CT protocol*	*Site*	*associated CT Signs*	*Surgery*	*etiology*	*outcome*
1	75 y male	Diffuse abdominal pain in a patient with atrial fibrillation	– unenhanced – Arterial phase – Portal phase	Left lobe (II III, IV)	– mesenteric venous gas – PI. – Anomaly of parietal enhancement – Occlusion of the superior mesenteric artery – Pneumoperitoneum	Yes	Acute Mesenteric infarction.	death
2	78 y female	septic shock	- unenhanced - Arterial phase - Portal phase	Segment II	- Hepatic perfusion disorders. - Bilateral pneumonitis.	No	Pneumonitis. Septic shock.	alive
3	73 y male	Postoperative course of a colonic tumor surgery, fever	- unenhanced - Portal phase	Left lobe (II III, IV)	- Multiple intraperitoneal collections.	Yes	Peritonitis	death
4	69 y female	CT after external biliary drainage.	unenhanced	Left lobe (II III, IV)	Contrast opacification of the bile ducts pneumibilia	No	Iatrogenic	alive
5	72 y male	Diffuse abdominal pain	unenhanced	Segments VII and VIII	No extra signs	yes	idiopathic	alive
6	71 y female	circulatory collapse	- unenhanced - Arterial phase - Portal phase	Left lobe (II III, IV)	- PI. - mesenteric venous gas - Anomaly of enhancement of intestine wall - Perfusion liver disorders.	No	Acute Mesenteric infarction.	death
7	67 y female	Diffuse abdominal pain	- unenhanced - Arterial phase - Portal phase	All the liver	- PI. - mesenteric venous gas - Anomaly enhancement of the wall of the digestive handles - Thinning of the wall inlets. - Obstruction of distal branches of the SMA	Yes	Acute Mesenteric infarction.	death
8	54 y male	Diffuse abdominal pain	- unenhanced - Portal phase	All the liver	- Perfusion liver disorders. - Multiple streams of necrosis, Heterogeneous enhancement of the pancreas	No	Necrotizing pancreatitis	death
9	66 y female	Fever and pain of the left lower quadrant.	- unenhanced - Portal phase	Left lobe (II III, IV)	Colonic diverticulosis with significant fat standing in front of the sigmoid diverticulum.	yes	Sigmoid diverticulitis.	alive
10	72yfemale	percutaneous drainage of a liver abscess and biopsy of a liver	- unenhanced - Portal phase	Left lobe (II III, IV) and segment VII	Liver collection (suspected tumoral necrosis)	no	iatrogenic	alive
11	43ymale	Clinic the waning of percutaneous radiofrequency ablation	- unenhanced - Portal phase	segment VIII	Cirrhotic liver 3 nodules treated with radiofrequency	no	iatrogenic	alive
12	82Y female	Diffuse abdomominal pain, shock	unenhanced	All the liver	- PI. - mesenteric venous gas	no	Acute Mesenteric infarction.	death
13	74Y male	epigastria pain	- unenhanced - Arterial phase - Portal phase	All the liver	-Anomaly enhancement of the wall of the digestive handles - Thinning of the wall inlets.	yes	Acute Mesenteric infarction.	alive