

Hepatic portal venous gas in the case of superior mesenteric artery thrombosis in a young adult-case report

Prakash Dhakal ¹, Suraj Sharma ¹, Abhishek Sharma¹, Shailendra Pandey², Sajiva Aryal³, Seema Bhnadari⁴

¹Department of Radiology, National Academy of Medical Sciences, Bir Hospital, Kathmandu, Nepal

²Tribhuvan University, Institute of Medicine, Kathmandu, Nepal

³Kathmandu University, Dhulikhel Nepal

⁴Tilganga Institute of ophthalmology, Kathmandu Nepal

Corresponding Author: Prakash Dhakal, Department of Radiology, National Academy of Medical Sciences, Bir Hospital, Kathmandu, Nepal, Email: dhakalprakashmed@gmail.com Phone number: +977- 9849110577

AUTHORS AND AFFILIATION

	NAME OF AUTHOR	AFFILIATION	AUTHOR/CO-AUTHOR
1.	Dr.Prakash Dhakal	Department of Radiology, National Academy of Medical Sciences, Bir Hospital, Kathmandu, Nepal	Author and corresponding author
2.	Dr.Suraj Sharma	Department of Radiology, National Academy of Medical Sciences, Bir Hospital, Kathmandu, Nepal	Co-Author
3.	Dr.Abhishek Sharma	Department of Radiology, National Academy of Medical Sciences, Bir Hospital, Kathmandu, Nepal	Co-Author
4.	Dr.Shailendra Pandey	Tribhuvan University, Institute of Medicine, Kathmandu, Nepal	Co-Author
5.	Dr.Sajiva Aryal	Kathmandu University, Dhulikhel Nepal	Co-author
6.	Dr.Seema Bhandari	Tilganga institute of Ophthalmology, Kathmandu Nepal	Co-author

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Abstract

Hepatic portal venous gas is diagnosed via computed tomography due to unusual imaging features. HPVG when linked with pneumatosis intestinalis has a high mortality rate and required urgent intervention. We present a case of 26 year old young adult with superior mesenteric artery thrombosis who presented with severe abdominal pain. On imaging HPVG and pneumatosis intestinalis were seen owing to the urgent intervention of the patient. The reliable interpretation of the imaging findings along with quick intervention led to the favorable outcome in our case. Herein we present a thorough review of the imaging findings of HPVG to make a reliable diagnosis when presented with such a case.

Abbreviation

CT: Computed tomography

HPVG: Hepatic Portal venous gas

PI: Pneumatosis Intestinalis

SMA: Superior mesenteric artery

Introduction

Gas in the portal venous system and its branches is a pathological disease known as hepatic portal venous gas (HPVG). The clinical symptoms of HPVG ranges from diseases that are benign to life-threatening.¹ This unusual imaging feature serves as a diagnostic indicator of serious abdominal illness.²

While the presence of either HPVG or Pneumatosis Intestinalis (PI) on a CT scan alone does not always indicate that there has been a bowel infarction, the presence of both of these illnesses on a CT scan is strongly linked to this condition, particularly if there is band-like pneumatosis. It typically denotes irreparable damage and transmural necrosis.³ A reported 75% mortality rate for HPVG linked with PI indicates that it is a life-threatening condition.²

Case report

A 26-year-old male patient presented to our emergency department with abdominal pain. The pain was diffuse throughout the abdomen and on and off in nature for a month which suddenly increased in severity for a day. He also had nausea and vomiting associated with it. However he did not complain of fever. His examination revealed blood pressure to be 130/70 mm hg, heart rate 100 bpm, respiratory rate of 22 per minute, temperature 98 F and SpO2 93%. Abdominal examination revealed marked abdominal tenderness diffusely. In addition, he had guarding and rigidity present.

Laboratory examination showed the following:

Total white blood cell count	$9.4 \times 10^9/L$
Neutrophils	68.1%
Hemoglobin	13gm%
Platelet	190000/cumm
Arterial blood gas analysis	
pH	7.4
PaO ₂	98
PCO ₂	42
HCO ₃ ⁻	23

Following the laboratory examination a CT scan of the abdomen was done.

Imaging finding:

CT finding of the patient

Non contrast and contrast CT of abdomen and pelvis was done, which demonstrate linear branching air attenuating areas (HU-998) in both lobes of liver involving periphery and in the region of portal venous branches, these features are suggestive of portal venous gas (Fig1). Post contrast study shows near total non-enhancing filling defect in superior mesenteric artery starting from approximately 2cm distal to its origin (Fig 2). There was thinning of bowel loops in pelvic region (probably small bowel loops) with hypo enhancing walls and multiple round cystic air attenuating areas within the bowel walls demonstrating pneumatosis intestinalis(Fig 3). Minimal free fluid is noted in pelvic peritoneal cavity.

Imaging diagnosis

Superior mesenteric artery thrombosis leading to the bowel ischemia along with pneumatosis intestinalis and hepatic portal venous gas.

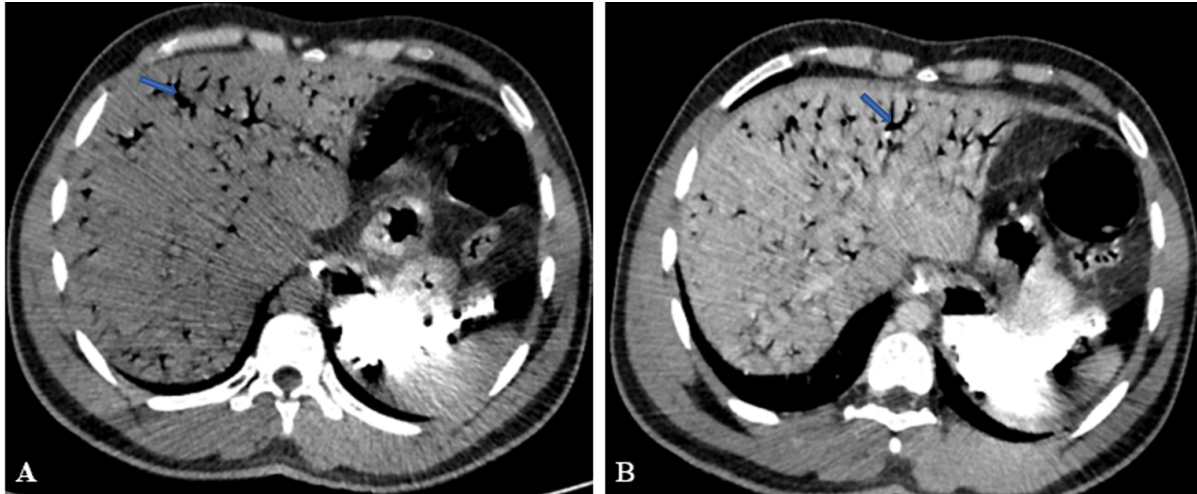


Fig 1: **A-** axial non contrast; **B-** axial post contrast CT images demonstrating linear branching hypoattenuating (HU-998) areas (arrow) in both lobe of liver extending up to the periphery and in continuation with portal venous branches.

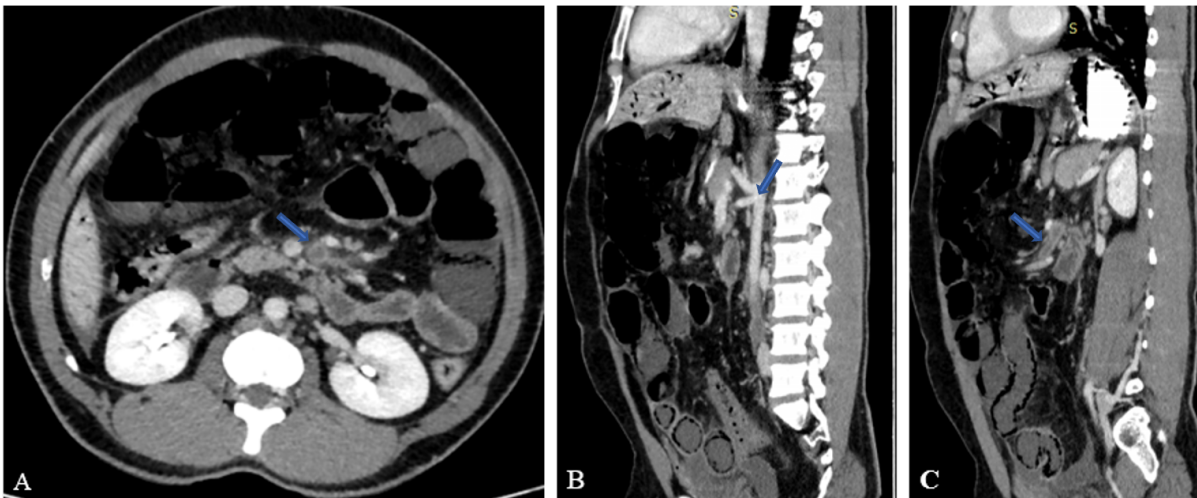


Fig 2: **A-**Post contrast axial CT image demonstrating filling defect in superior mesenteric artery (arrow). **B-**Post contrast sagittal CT image demonstrating celiac trunk and superior mesenteric artery with contrast opacification in their proximal aspect (arrow). **C-** Post contrast sagittal CT image demonstrating non enhancing filling defect in superior mesenteric artery starting from approximately 2 cm distal to its origin (arrow). **Fig 2 B** and **C** also demonstrates air attenuating areas within the bowel wall (pneumatosis intestinalis) and minimal free fluid in pelvic peritoneal cavity.

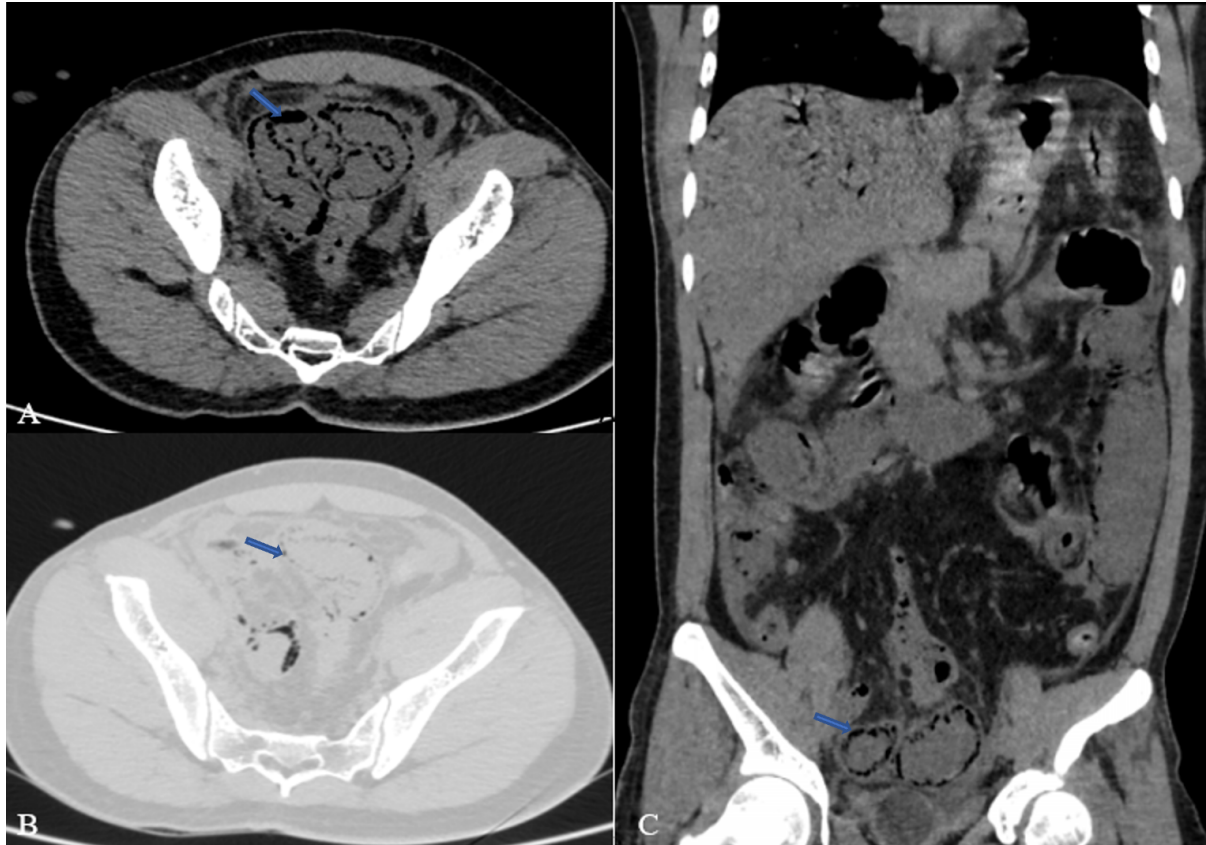


Fig 3: **A**-axial non contrast (soft tissue window), **B**-axial non contrast (lung window) and **C**-coronal non contrast CT images showing thinning of bowel walls in the pelvic region (probably small bowel loops) with multiple round cystic air attenuating areas within the bowel wall (arrows) demonstrating pneumatosis intestinalis.

Discussion

Hepatic portal venous gas (HPVG) is a rarely described form of pneumatosis and refers to gas within the portal vein.⁴ Radiologically, linear branched radiolucencies that reach the liver's edge

within 2 cm are referred as HPV_G.² The first case of HPV_G was described in 1955 by Wolf and Evans.⁵

Mucosal damage, bowel distension and sepsis caused by gas forming bacteria are the three possible mechanism of HPV_G. A necrotic bowel was present in more than two thirds of patients with hepatic portal venous gas. Pneumatosis intestinalis(PI), subserosal and submucosal gas-filled cysts in the digestive tract, is frequently accompanied by hepatic portal venous gas.^{2,6,7} Numerous fatal and non-fatal diseases and disorders, including intestinal necrosis, total or partial bowel obstruction, intraperitoneal abscess, ulcerative colitis, gastric ulcer, Crohn disease, trauma, endoscopic procedure complications, and diverticulitis, are associated with HPV_G. The main cause of HPV_G is ischemic bowel with subsequent intestinal necrosis.²

HPVG is a rare occurrence, and it is challenging to treat.⁶ It is even more challenging and has higher mortality when it is associated with bowel necrosis as reported by Kinoshita et al⁵. In our case, HPV_G along with Pneumatosis Intestinalis manifested as a result of bowel ischemia due to superior mesenteric artery (SMA) thrombosis which later caused the necrosis.

HPVG is diagnosed radiologically using ultrasound or computed tomography (CT). However, CT has higher sensitivity for its diagnosis among all and used as gold standard for its diagnosis.^{2,5} Ultrasound shows either echogenic particles flowing within the portal vein or poorly defined, echogenic patches within the hepatic parenchyma, mostly in nondependent part.⁵ It is possible to dynamically image the centrifugal flow of portal gas to the hepatic periphery using color Doppler flow imaging, differentiating it from biliary gas.² In CT imaging, HPV_G appears as branching lucencies that extend to within 2 cm of the liver capsule, primarily in the anterior-superior portion of the left lobe. As opposed to biliary gas (pneumobilia), which is linked to air in the liver's center but does not reach as far toward the liver capsule as does HPV_G (air in HPV_G extends to a less than 2 cm from the liver capsule, whereas in pneumobilia it does not reach to that extent), pneumobilia is characterized by air within the liver's central region.⁸ HPV_G was diagnosed using CT imaging in our case which showed shows near total non-enhancing filling defect in superior mesenteric artery starting from approximately 2cm distal to its origin (Fig.2). It was also associated with the finding of PI seen as was thinning of bowel loops in pelvic region (probably small bowel loops) with hypo enhancing walls and multiple round cystic air attenuating areas within the bowel walls (Fig.3).

Treatment of HPV_G mostly depends upon the underlying cause. It also depends on the presence or absence of peritonitis or intestinal perforation, as well as the patient's general condition, as they are the primary characteristics that direct clinicians in their therapeutic strategy.⁹ Our patient's condition was deteriorating. He was resuscitated with intravenous fluid and antibiotics. With the diagnosis of the bowel ischemia due to SMA thrombosis, he underwent emergency explorative laparotomy and resection and anastomosis was done (Fig.4). Fortunately, he became stable and improved after the surgery.



Fig 4: Image of the necrosed bowel revealed after surgery

Conclusion

HPVG is not always a sign of a fatal intraabdominal pathology, however it may be seen in such kind of illness. It can be diagnosed by Ultrasound or CT scan (which is considered as gold standard for its diagnosis). The treatment depends on the underlying pathology as in our case it was due to bowel ischemia resulting from SMA thrombosis. He had to undergo surgical treatment due to the deteriorating clinical status. It is vital for a clinician to recognize when HPVG can be life threatening and require intervention.

Conflict of interest:

There is no conflict of interest among authors.

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