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Computed Tomographic Finding of Hepatic Portal Venous Gas in a Patient with Perforated Sigmoid Adenocarcinoma: Case Report

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Abstract

Hepatic Portal Venous Gas (HPVG) is a rare entity which may require emergent surgical intervention. Detection is usually obtained by various radiological techniques such as plain radiological imaging, Ultrasonography (US) or Computed Tomography (CT) scan. Recognition of portal venous gas is predominately seen in conditions such as mesenteric ischemia and colitis. Portal venous gas alone is usually secondary to an underlying disease which requires surgical intervention. The outcome of the disease is dependent upon the pathology of the underlying cause. In this case, portal venous gas was an incidental finding during computed tomography which was performed for further investigation in an elderly patient with a perforated obstructing bowel tumor.

Keywords

Hepatic Portal Venous Gas; Cancer; Bowel Ischemia; Mucosa; Sigmoid Colon

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Introduction

Hepatic portal venous gas was and currently is a rare condition which was previously described in infants with necrotizing enterocolitis in 1955 by Wolfe and Evans. The first adult case was recorded by Susman and Senturia in 1960 in a patient who suffered small bowel gangrene [1,2]. Although the radiological appearance of portal venous gas till this day is not quite understood, the prognosis depends on the underlying factors. There are various underlying causes leading to hepatic portal venous gas which are caused by destruction of the colonic mucosa in combination to overgrowth of bacterial gas leading to bowel distention and eventually leading to HPVG [1,3]. The most common causes of HPVG as reported by Hussain, et al., bowel ischemia and mesenteric vascular pathology 61.44%, inflammation of the gastrointestinal tract 16.26%, obstruction and dilation 9.03% followed by sepsis, iatrogenic injury, trauma and most rarely cancer [4]. Reports of HPVG is currently an ongoing rare condition which can lead to a fatal outcome having a mortality rate of 75% to 90%. Due to advancements in medical radiography the use of computed tomography and ultrasonography can lead to early detection, extent and cause of the disease which can prevent fatal outcomes [6-8]. The mortality rate and prognosis are determined by the underlying factor and not the presence of portal venous gas alone [9,10]. Recent studies have shown a decrease in mortality with a mortality rate of 39% [11]. This case presentation will report a rare case of HPVG in an elderly patient with newly diagnosed colonic cancer.

Case Presentation

An 81 year old female patient with a medical history of controlled hypertension and tremor with no previous surgical history presented to the emergency department with chief complaints of abdominal pain, nausea without vomiting, early satiety, dysuria and worsening constipation that began two months prior. In the emergency department she presented with normal blood pressure, tachycardia 115 and without fever. Abdominal examination demonstrated slight tenderness upon palpation of the hypogastric region. Bloodwork revealed normal WBC count, Hb 12 g/dl, CRP 4.1, LDH 617 U/I and creatinine level of 0.74 mg/dl.

Approximately, one week prior to her current admission, she presented to the emergency department with complaints of constipation and urinary symptoms. She was treated accordingly and discharged with recommendations to undergo further evaluation which included a gastroscopy and colonoscopy. The patient underwent the endoscopic procedures which determined that the probable cause to her ongoing constipation was an obstructing space occupying lesion located approximately 30 centimeters proximal from the rectum (Fig. 1). A biopsy was taken for further analysis. Prior to the result of the lesion biopsy a computed

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tomography with contrast of the chest and abdomen was carried out to further reveal the extent of the disease. Tomographic imaging of the abdomen revealed a 6.5 cm perforated space occupying lesion of the sigmoid colon, stranded fat with free air and thickened walls of the sigmoid colon (Fig. 1) and the rare finding of peripheral portal venous gas (Fig. 1). Other findings presented suspected penetration of the lesion into the urinary bladder as well. Eventually the biopsy results indicated that the space occupying tumor was adenocarcinoma. Due to the aforementioned diagnosis the patient underwent surgical resection of the lesion. Surgical findings included a tumor occupying the sigmoid colon with invasion of the ileum 15 cm from the ileocecal valve (Fig. 2) and suspected penetration of the urinary bladder which was ruled out by methylene blue injection via a urinary catheter. Partial small bowel resection was carried out with sigmoidectomy and construction of a colostomy. The surgical intervention was concluded without any surgical complications.

Figure 1: (A) Represents the space occupying lesion which was seen during colonoscopy approximately 30 centimeters from the rectum. (B) CT imaging shows the perforated tumor with surrounding inflammatory findings. (C and D) Arrows represent the HPVG in CT imaging.

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Figure 2: Surgical imaging shows the sigmoid colon with the tumor invading the ileum.

Discussion

As there have been a minimal number of reported cases throughout a vast period HPVVG has a low incidence rate and is especially a rare encounter in cancer at 1.8% [4]. HPVVG was first a radiological finding which was first described by Wolfe and Evans in 1955 in infants suffering from the condition of necrotizing enterocolitis [1,10]. Lazar, et al., reported the first survivor of HPVVG in 1965 who suffered from chronic ulcerative colitis [12]. Since HPVVG is a rare entity, the ratio of male to female has yet to be concluded but the presence of this condition usually affects the elderly due to many predisposing conditions [2,4]. Since its first documentation HPVVG has only 182 documented cases in the literature by 2001 [13].

Many studies have described the causes and presumed pathogenesis of HPVVG which concluded that mucosal disruption is due to various underlying factors such as bowel ischemia or cancer which lead to invasion of gas as well as microorganisms into the portal system through damaged mucosa [1]. Predisposing factors of HPVVG include bowel ischemia, mesenteric vascular pathology, inflammation of the gastrointestinal tract, obstruction and dilation, sepsis, iatrogenic injury, trauma and most rarely cancer [1,2,4]. HPVVG is also commonly associated with pneumatosis intestinalis, an intramural gas formation that may indicate a necrotic bowel [14].

Hepatic portal venous gas is usually a secondary finding in patients having underlying causes which not necessarily lead to an uneventful prognosis but rather are treated conservatively. In some cases, HPVVG is commonly mistaken as pneumobilia (gas in the biliary tree). Though it

may have a resemblance, pneumobilia differs as it involves the portahepatis in the center of the liver and doesn't extend up to 2 cm from the liver capsule [15].

Identification of predisposing factors can affect the diagnosis of HPVG and will differentiate the appropriate management required to prevent a harmful outcome. Even though HPVG is still not quite understood most patients presenting with HPVG will present with abdominal pain while others are usually asymptomatic and will have HPVG as a secondary or incidental finding while examination of carried out for another cause [4,11,15].

Diagnosis of the HPVG when first suspected is critical and requires immediate investigation and management of the underlying cause. HPVG was first described by plain radiographic imaging but nowadays diagnostic approach is fulfilled by computed tomography and sonographic imaging [2,4,10,11]. Computed tomography has become the gold standard for the diagnosis of HPVG. Diagnosis which is made by CT scan will show gas in the portal system, mainly in the left lobe of the liver extending up to 2 cm from the liver capsule. Ultrasonographic imaging can also detect HPVG but has a lower sensitivity rate [2,3,4,10,11,13].

Once a diagnosis is made prompt medical and surgical intervention should be carried out in order to prevent an increased mortality rate as seen in previous documented studies which showed mortality rates of up to 75-90% [6,7]. Bowel ischemia associated HPVG is an indication for immediate surgical intervention to eradicate the underlying cause. As seen in previous studies HPVG does not always indicate the need for surgical intervention but rather conservative intervention can be carried out depending on the clinical state of the patient and whether the underlying cause presents no severe medical complication as seen in a case studies performed by M Laharwal, et al., and Algahtani, et al., [2,3].

As noted, HPVG is most commonly seen as a secondary finding which is usually associated with a probable severe underlying etiology which will require urgent surgical intervention or in some cases conservative treatment with simple observation of the patient.

Conclusion

As HPVG associated with colon cancer is a rare finding we have seen in our patient HPVG was an incidental finding on computed tomographic during further analysis of the extent of the cancerous lesion. The most probable pathogenic cause in our case is mucosal damage due to a perforated cancerous lesion which lead to disruption of the portal venous system causing gas to enter the venous system.

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