Answer

Portal Vein Gas Associated With Pneumatosis Intestinalis

Pneumatosis intestinalis is the presence of gas in the intestinal wall and may be associated with gas in the portal vein.[1] Two nonexclusive theories to explain the source of the gas have been proposed: (1) the gas may enter the circulation because of increased pressure in the bowel lumen associated with damaged mucosa or increased pressure inside an abscess; or (2) gas-forming bacteria may be present in the portal venous system.[2] While clostridial organisms are widely recognized for their gas-forming potential, other gram-negative pathogens (eg, *Escherichia coli*) may produce a similar clinical picture.[3]

In our patient, coronal computed tomography (Figure 1) showed diffuse pneumatosis intestinalis (small- and large-bowel wall), intrahepatic and extrahepatic portal vein gas (including superior mesenteric and splenic veins), intestinal edema, and ascites. He also had a reducible inguinal hernia. Because there was suspicion of acute mesenteric ischemia due to a high lactate level, the patient underwent urgent laparotomy and resection of ascending colon and distal ileum (**Figure 2**A). He died of multiorgan failure associated with sepsis (*E coli*) on postoperative day 2. The resected colon specimen showed signs of ischemic damage of the mucosa without intramural necrosis, edema, and hemorrhage (Figure 2B). At autopsy there was no evidence of mesenteric artery stenosis or thromboembolism. No diverticulum was found. Perforation of the duodenum in the setting of recent endoscopic retrograde cholangiopancreatography was also ruled out. The liver showed evidence of cholangitis (cholestasis and marked neutrophilic infiltrates with evidence of bacteria) and no evidence of rejection. There were also scattered areas with empty spaces, which most likely corresponded to the parenchymal gas observed in the computed tomographic scans. Splanchnic hypoperfusion associated with cholangitis or sepsis was the most likely mechanism to explain the ischemic colitis (watershed zones of the colon) and pneumatosis intestinalis.

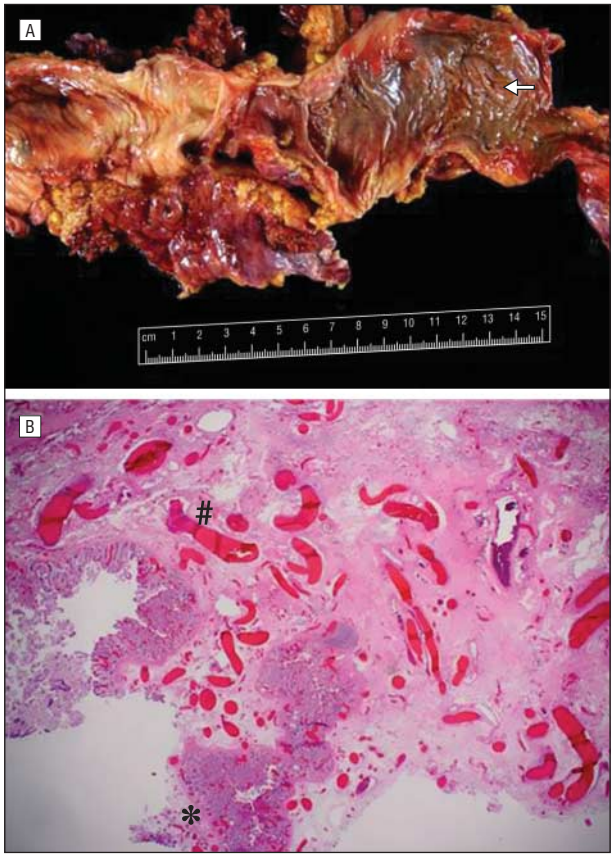

Figure 2. The resected colon specimen showed ischemic colonic mucosa (arrow) (A), and histologic analysis of the specimen showed signs of ischemic damage of the mucosa without intramural necrosis (*), edema, and hemorrhage (#) (hematoxylin-eosin, original magnification ×200) (B). At autopsy there was no evidence of mesenteric artery stenosis or thromboembolism. No diverticulum was found.

Kwon et al[4] reported 22 cases of pneumatosis in a total of 2080 patients who had undergone liver transplantation (1%). Most of the cases (82%) resolved either spontaneously or with conservative management. The right colon was affected in all 22 cases. The combination of pneumatosis in the colon and small bowel or portal vein portends a poorer prognosis. In this series, the patients died in all cases when the small bowel or portal vein was affected.

In a series of 182 cases of hepatic portal vein gas (all cases reported in the literature until 2001),[2] 16 patients manifested signs of shock on admission. A surgical approach was undertaken in 83 cases (46%) and conservative therapy was used in 79 cases (43%). The management of the other 20 cases was not reported. The overall mortality was 39%; mortality was higher (75%) when bowel necrosis was present. The best treatment of patients with portal vein gas depends on the underlying disease. Emergent operation should be considered when bowel ischemia or necrosis is suspected.[2]

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