

# Ultrasound Imaging of Pneumatosis Intestinalis

CME  
Credits

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Dear Editor,

A 63-year-old man who had hypertension and type 2 diabetes mellitus presented to the emergency department after vomiting and diarrhea symptoms for 2 days. The diarrhea symptoms were watery, mild blood-tinged stool with a frequency of more than 5 times in 1 day. On arrival, his vital signs were as followings: heart rate of 123 beats/min, body temperature of 36.1°C, and blood pressure of 100/61 mmHg. On physical examination, the patient exhibited tenderness over the entire abdomen without peritoneal sign. Laboratory examinations revealed white blood count of  $4.95 \times 10^3/\mu\text{L}$  with 84% neutrophil, aspartate aminotransferase of 16 IU/L, creatinine of 2.31 mg/dL, glucose of 505 mg/dL, and severe lactic acidosis (lactate concentration of 8.05 mmol/L, pH of 7.22,  $\text{PCO}_2$  of 39.4 mmHg,  $\text{HCO}_3^-$ -concentration of 16.0 mmol/L, and base excess of  $-10.9$  mmol/L). We performed point of care ultrasound on this patient [Figure 1].

The ultrasonography [Figure 1] revealed diffuse small bowel wall thickening and air in the layer of the small intestine wall. The air appeared to be trapped in the intramural level, and a lack of movement with bowel compression was detected by the probe. The patient subsequently received non-contrasted abdominal computed tomography (CT), which revealed air bubbles in the small intestine wall [Figure 2] and portal vein system [Figure 3]. This phenomenon is called pneumatosis intestinalis (PI) and aeroperforia.

He received exploratory laparotomy which disclosed severe enterocolitis with cloudy ascites but no evidence of bowel infarction. The culture results of ascites and blood were negative. The patient was discharged after 30 days of intensive care.

PI is an imaging phenomenon that represents the presence of gas in the intestine wall.<sup>[1]</sup> In 2014, Huang *et al.*<sup>[2]</sup> reviewed many cases of PI that diagnosed by ultrasonography. However,



**Figure 1:** Ultrasound sonography revealed air trapped in small intestine wall and bowel wall thickening (arrow)

they did not mention the details of ultrasound findings of PI. Ultrasound findings of PI typically revealed air trapped in the intestine wall, which is called the “circle.”<sup>[1]</sup> PI exhibits several features in ultrasonography, such as the actual visualization of the gas in the wall, lack of motion of the bubbles over time in the periphery of the bowel wall, and lack of movement of the bubbles with compression.<sup>[1]</sup> CT remains the most sensitive imaging tool for the identification of PI. However, in our experience, there exist some advantages to using ultrasound in detecting PI. These advantages are as follows: (1) ultrasound can be immediately performed at the patient’s bedside, (2) ultrasound can be obtained repeatedly for follow-up, (3) ultrasound can differentiate intraluminal air from intramural air through the real-time compression test in cases where differentiating the air level of the bowel in CT

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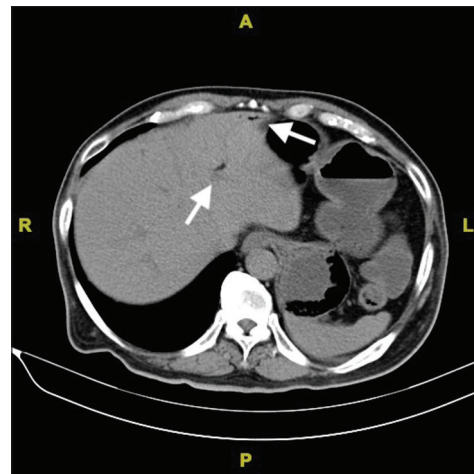
**Figure 2:** Computed tomography revealed (arrow) air bubbles in small intestine wall

scans is difficult, and (4) ultrasound is valuable for detecting PI in pediatric patients because of its radiation-free nature and the high ultrasonography quality obtained.<sup>[3]</sup>

PI is usually considered as a common indicator of ischemic bowel disease; however, it can originate from other relatively benign causes, including diverticulitis, colitis, enteritis, intestinal obstruction, and cancer.<sup>[4]</sup> Distinguishing intestinal infarction from benign conditions is crucial. However, distinguishing them from image studies is difficult. The main treatment for bowel infarction is exploratory laparotomy. A delayed exploratory surgery for bowel infarction worsens the patient's outcome.<sup>[5]</sup>

#### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published, and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.



**Figure 3:** Computed tomography revealed (arrow) air in the portal vein system

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#### Conflicts of interest

There are no conflicts of interest.

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