RadioGraphics

Ascariasis Causing Small Bowel Volvulus[1]

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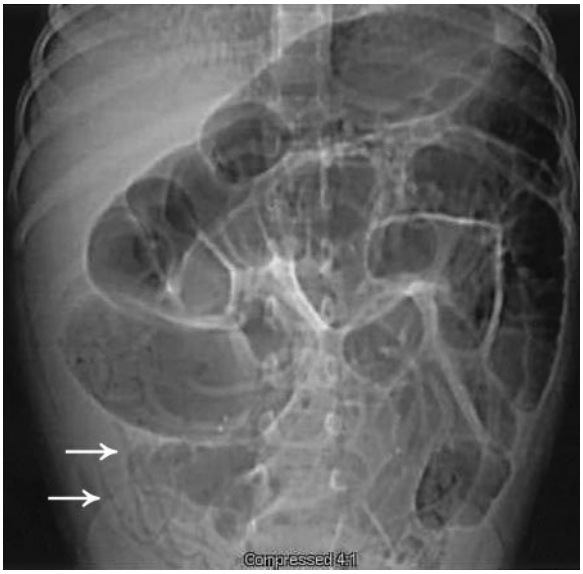
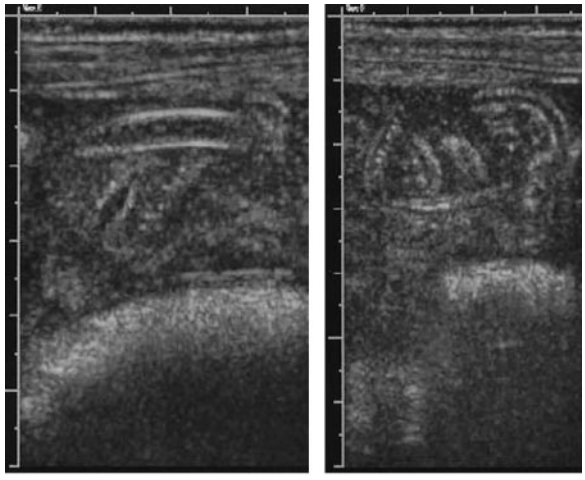


Figure 1. Radiograph demonstrates multiple loops of dilated bowel throughout the abdomen. Multiple air-filled tubular structures are also seen, mostly in the right lower quadrant (arrows).



a. **b.**

Figure 2. Sagittal **(a)** and transverse **(b)** US images of the left lower quadrant show multiple pairs of curvilinear echogenic lines within an adynamic, fluid-filled small bowel.

History

A 2-year-old boy presented to the emergency department with a 1-day history of colicky abdominal pain, repeated emesis, and anorexia. At initial examination, the patient had a silent distended abdomen with involuntary guarding. Results of initial laboratory tests, including white blood cell count and urinalysis, were within normal limits. Supine and upright radiographs of the abdomen were interpreted by the emergency department physician as demonstrating a possible small bowel obstruction. Ultrasonography (US) of the abdomen was ordered to exclude an ileocolic intussusception.

Imaging Findings

Abdominal radiography demonstrated gaseous dilatation of the stomach and multiple loops of small bowel. Multiple air-filled tubular structures projected over several loops of small bowel in the abdomen and pelvis (Fig 1). Abdominal US demonstrated multiple loops of massively dilated, nonperistaltic small bowel. Curvilinear pairs of echogenic lines with a relatively hypoechoic central portion were observed within most of these loops. These structures were seen to move independently during real-time observation. A small amount of free intraperitoneal fluid was also identified (Fig 2).

Arterial phase multi–detector row computed tomography (CT) also demonstrated multiple massively dilated loops of small bowel. Multiple elongated, tubelike structures, some of which were air filled, were seen within most of the small bowel loops. Wall thickening and enhancement of

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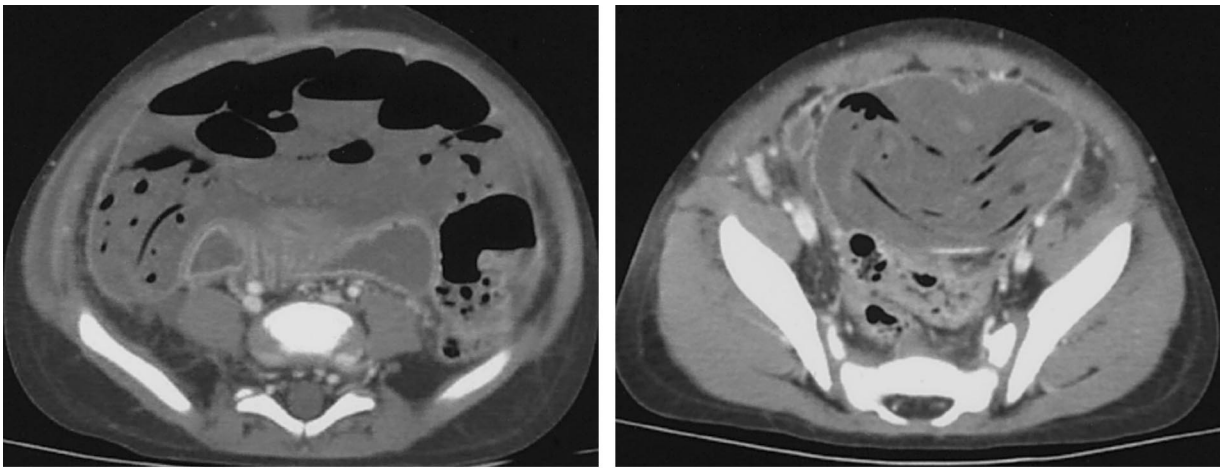


a. b.

Figure 3. Contrast material–enhanced CT scans (**a** obtained at a higher level than **b**) of the abdomen demonstrate multiple dilated, fluid- and gas-filled loops of small bowel. Multiple curvilinear structures, most of which are gas filled, are seen within the bowel. These structures proved to represent the roundworm *Ascaris lumbricoides.*

the terminal ileum was also noted (Fig 3). These findings were believed to represent mechanical small bowel obstruction by ascariasis with associated bowel ischemia.

Pathologic Evaluation

Surgery revealed a small bowel volvulus that involved the distal ileum. The small bowel was filled with roundworms, and approximately 2 feet of the terminal ileum was necrotic (Fig 4a, 4b). As many of the worms as possible were milked into the necrotic small bowel before it was removed. The remainder of the worms were milked to and removed through the surgical opening in the distal small bowel. A direct end-to-end anastomosis was created. Gross pathologic evaluation demonstrated approximately 2 feet of small bowel with mucosal and focal wall necrosis. There were numerous roundworms within the bowel segment, ranging from 10 to 35 cm in length and from 2 to 6 mm in diameter (Fig 4c).

Discussion

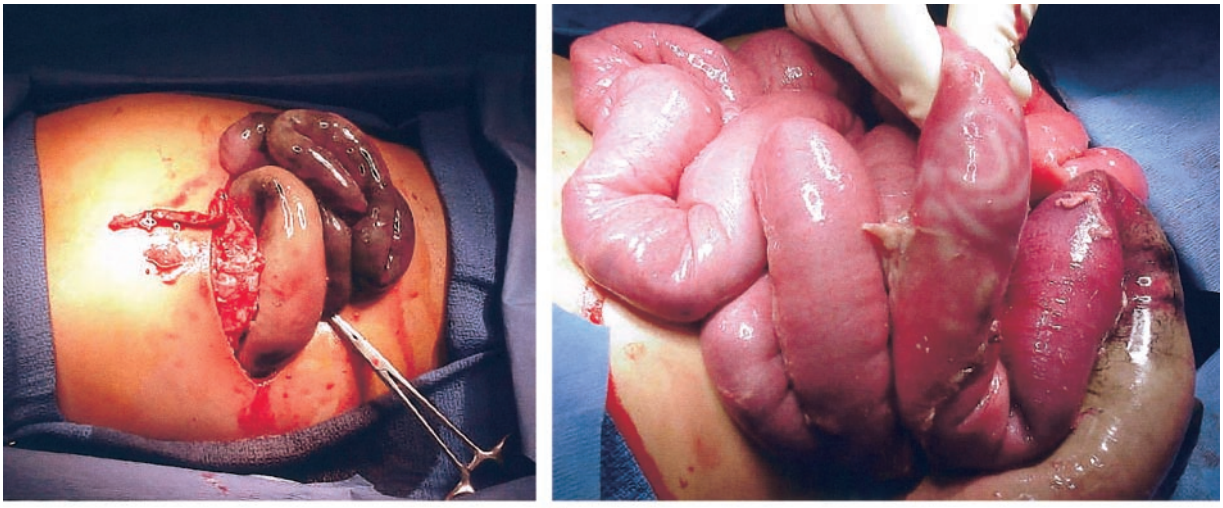
Ascariasis is a common problem, with approximately one-fourth of the world population infected at any given time. However, it is much less common in developed countries and relatively rare in the United States (1). The term *ascariasis* refers to intestinal infection by the roundworm *A lumbricoides.* The life cycle of *A lumbricoides* begins when embryonated eggs are passed in the feces of an infected individual. These eggs can then contaminate soil, water, or even food. Humans become infected after ingesting contaminated material. Gastric secretions then cause the eggs to hatch in the small bowel. The larvae penetrate the intestinal mucosa and are hematogenously transported to the lung. Pulmonary manifestations vary widely. The worms grow while in the alveoli, eventually travel up the airway to the epiglottis, and are swallowed again. Once they are back in the small bowel, the worms grow to lengths of up to 35 cm. The life span of an adult female worm is 6 months to 1 year (2).

Pulmonary manifestations occur 5–26 days following ingestion of viable eggs. *Ascaris* pneumonia may develop and consists of migratory, transient, localized intraalveolar inflammatory reactions. Pulmonary ascariasis is the most common cause of Loeffler syndrome, which is characterized by fever, cough, sputum, asthma, eosinophilia, and infiltrates seen at chest radiography.

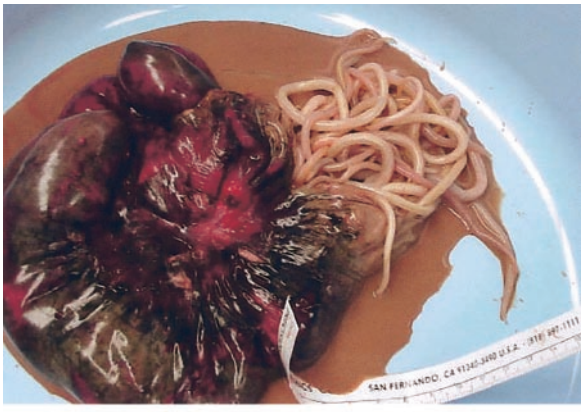
The most common complication of ascariasis is mechanical bowel obstruction caused by a large number of worms. Bowel obstruction can also be caused by various toxins released by the worms. A large worm bolus can also cause volvulus or intussusception (3). Infestation with *A lumbricoides* can cause a variety of other complications as well, including pancreatitis, cholecystitis, and liver abscess (2,4). Rare complications include cardiac tamponade and airway obstruction (5,6).

Patients with ascariasis are often asymptomatic or have vague symptoms such as nausea, vomiting, anorexia, abdominal discomfort, or colicky pain. When complete bowel obstruction occurs, the patient can have severe colic, abdominal distention, nausea, vomiting, fever, and eosinophilia. A worm bolus may manifest as a palpable mass in the right lower quadrant or periumbilical area. Most patients have a history of passing adult worms via the mouth or rectum.

Worms can often be seen on conventional abdominal radiographs as curvilinear soft-tissue-



a. b.



c.

Figure 4. **(a)** Photograph obtained during exploratory laparotomy shows multiple loops of small bowel, all of which are necrotic. **(b)** Multiple *A lumbricoides* roundworms are seen through the bowel wall on this intraoperative photograph. **(c)** Photograph shows the excised small bowel full of roundworms.

density cords. If bowel obstruction is present, the typical pattern of air-filled, dilated loops of small bowel with multiple air-fluid levels can be seen on an upright radiograph. US will depict the adult worm as a hypoechoic tubular structure with well-defined echogenic walls. During real-time evaluation, the worms can be seen making curling movements. Although CT is not the modality of choice for diagnosis of ascariasis, the worms can usually be visualized within the bowel lumen at CT with soft-tissue windowing (7).

Treatment with oral administration of a single 400-mg dose of albendazole is usually successful (8). However, in the presence of bowel obstruction, surgery is usually indicated. Bowel resection with creation of an end-to-end anastomosis is necessary only when bowel necrosis is identified. Otherwise, the worms can simply be milked into the colon, from which they will subsequently pass (3). In this case, the patient underwent emergency surgery for high-grade small bowel obstruction. He had an uneventful recovery.

In summary, although ascariasis is not commonly seen in the United States, it is very prevalent in developing countries. The diagnosis of intestinal ascariasis can usually be made with conventional radiography of the abdomen. Other modalities such as CT and US can also be used. Small bowel obstruction is the most common complication. Medical treatment for *Ascaris* infestation is usually successful; however, bowel obstruction may necessitate surgical intervention.

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