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Helicobacter pylori associated antral gastritis and ulcer disease: Imaging by computed tomography and ultrasound.

Clinical History

This 10 year old male presented to the emergency department after several days of progressive epigastric pain, nausea, and vomiting. He was clinically dehydrated and had mild leukocytosis. Abdominal CT was performed on the evening of presentation, revealing circumferential edema in the wall of the gastric antrum (Figure 1). There was a questionable mucosal defect at the posterior wall, raising concern for an ulcer (arrow, Figure 1). Abdominal ultrasound was performed the following day, confirming antral gastritis (Figure 2) and demonstrating a deep mucosal defect in the posterior wall, consistent with an ulcer (Figure 3). Stool assays were positive for H. pylori. The patient was treated with carafate, proton pump inhibitors, and appropriate antibiotics. His symptoms improved rapidly, and within two weeks he had returned to his clinical baseline. The patient remained asymptomatic for three months, after which he was lost to follow-up.

Figures

Figure 1

Figure 2

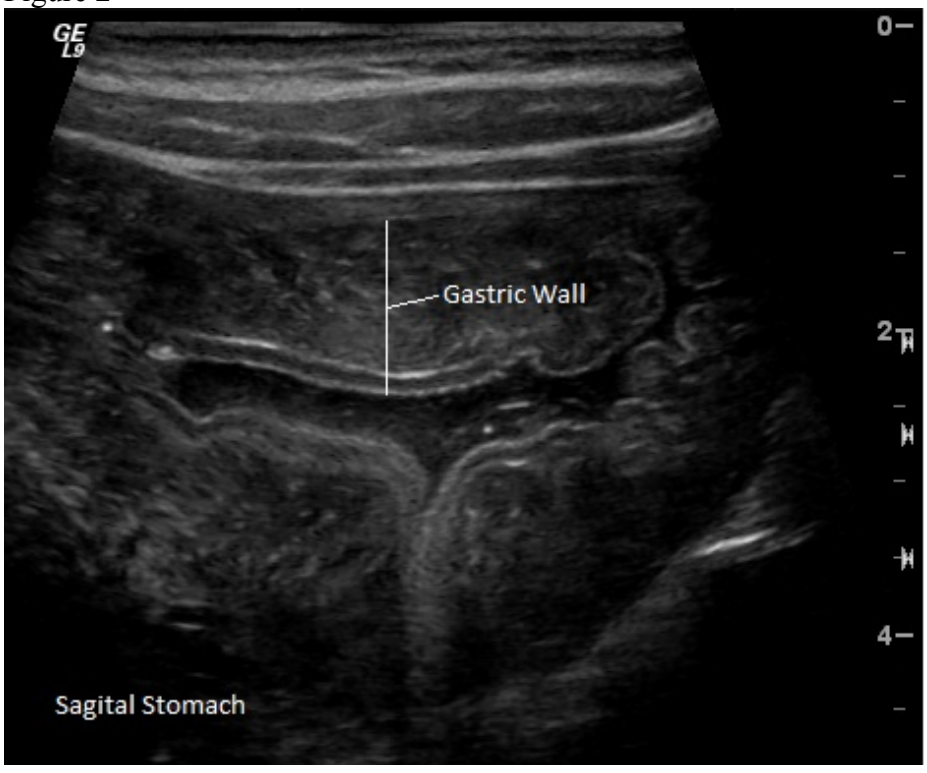

Figure 3

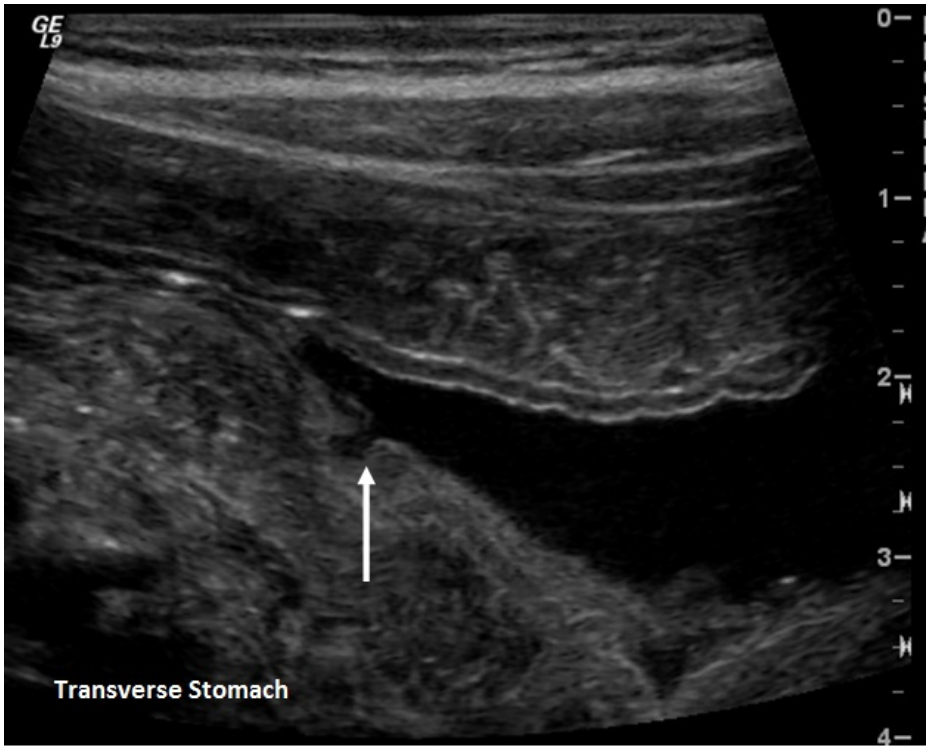

Figure Legend

Figure 1 – Axial contrast-enhanced CT through the level of the stomach demonstrates circumferential gastric antral wall thickening, mucosal enhancement, and submucosal hypoattenuation, which represents edema. There is mucosal irregularity at the posterior wall of the gastric antrum (arrow), raising suspicion for an ulcer.

Figure 2 – Sagital gray-scale sonogram through the gastric antrum demonstrates marked, circumferential gastric wall thickening, consistent with gastritis.

Figure 3 – Transverse gray-scale sonogram through the gastric antrum (similar orientation to that observed on above CT) demonstrates loss of the normal multilaminar gut signature at the posterior wall, and a mucosal defect extending into the submucosal tissues of the gastric wall, consistent with an ulcer (arrow). This finding persisted throughout the exam, and was distinct from normal rugal folds.

Diagnosis
Helicobacter pylori associated antral gastritis and ulcer disease.

Discussion
Helicobacter pylori is a common chronic bacterial infection that affects approximately 50% of the world population [1,2]. The infection is generally acquired early in life

(usually by age 10), with transmission occurring predominantly within families, via oral ingestion of contaminated body fluids [1,2,3].

H. pylori is the leading cause of gastritis and peptic ulcer disease [2,3]. Noninvasive diagnostic tests for H. pylori infection include the urea breath test, serologic studies, and stool antigen assays. When patients develop typical symptoms of gastritis or peptic ulcer disease, endoscopy with biopsy is often performed [3]. Findings of gastritis and peptic ulcer disease have also been described with multiple noninvasive imaging modalities, including double contrast radiography [4], ultrasound [5,6,7], and CT [8].

In the adult population, double contrast radiography is considered the imaging study of choice for characterizing gastritis and peptic ulcer disease. Typical findings of gastritis include thin mucosal striations oriented perpendicular to the long axis of the gastric antrum, thickened rugal folds, and a granular appearance of the mucosa with numerous 1-2 mm mucosal nodules [4]. Peptic ulcers are mucosal defects that penetrate through the muscularis mucosa into the deeper layers of the gastric wall. These ulcers are demonstrated by either a focal barium pool within a depressed mucosal defect, or a thin rim of barium outlining the margins of an unfilled ulcer [4].

While double contrast radiography can effectively characterize the mucosal irregularities of gastritis and ulcer disease in pediatric patients as well as in adults [5], it is rarely the initial imaging study performed in children with abdominal pain. This is due to the nonspecificity of acute abdominal pain in the pediatric population. In 1141 children (ages 2-12) with acute abdominal pain (defined as lasting $\leq$ 3 days), the 5 most frequent final diagnoses were URI/otitis media (18.6%), pharyngitis (16.6%), viral syndrome (16.0%), abdominal pain of unknown etiology (15.6%), and gastroenteritis (10.9%). Approximately 1% of patients ultimately required surgery: 10/12 for appendicitis, 1 for intussusception, and 1 for abdominal adhesions [9].

Given the nonspecificity of acute abdominal pain in children, and because appendicitis is the most common pathology requiring abdominal surgery in this population, the diagnostic work-up in emergency departments usually includes ultrasound and/or CT, both of which are highly sensitive and specific for appendicitis [10]. Although gastritis and peptic ulcer disease will rarely be the etiology of abdominal pain, they can be demonstrated on each of these modalities and warrant consideration given the prevalence of H. pylori and its frequent transmission to children by 10 years of age.

Ultrasound can be used to effectively evaluate the stomach and duodenum [5,7]. Sonographic examination of the gastric antrum and proximal duodenum is optimized by having the patient ingest water to fill the stomach and turning the patient into a right lateral decubitus position to move air into the nondependent gastric body and fundus. A mucosal thickness greater than 4 mm in the gastric antrum is considered suggestive of gastritis [5]. Marked transmural gastric wall thickening (as in Figures 2 and 3) has also been described as typical of gastritis, with documented resolution after appropriate therapy [7]. The presented case demonstrates loss of the normal multilaminar gut signature at the posterior wall of the gastric antrum (Figure 3), another useful ultrasound

characteristic of inflammation in the gastric wall. While ulcers are not frequently visualized by ultrasound, this case clearly exhibits a deep mucosal defect, which penetrates into the edematous muscle tissue of the gastric wall (Figure 3). These findings are analogous to the typical description of findings by double contrast radiography [4].

Computed tomography can demonstrate similar findings to ultrasound in the setting of gastritis and peptic ulcer disease. Typically, there is wall thickening in the gastric antrum, frequently with extension along the posterior wall and greater, as well as prominent gastric folds [8]. As in the presented case, the mucosa often appears hyperenhancing next to the hypoattenuation of edematous submucosa (Figure 1). Ulcers are rarely demonstrated by CT, primarily because they are usually superficial mucosal lesions. Even deep ulcers may not be apparent on CT due to under-distention of the gastric antrum and proximal duodenum, causing apposition of mucosal surfaces. However, CT is sensitive for ulcer perforation, which causes marked inflammation in adjacent tissues and leads to free intraperitoneal air [8].

In summary, Helicobacter pylori infection is very common, and is the leading cause of gastritis and peptic ulcer disease. While these entities are not frequently diagnosed in the pediatric population, they can be identified on imaging modalities that are commonly used in the work-up of abdominal pain in children. When performing real-time ultrasound examination, inclusion of gastritis and peptic ulcer disease on the diagnostic differential will allow optimization of technique in order to appropriately image the stomach and proximal duodenum in appropriate cases.

References

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