

AMSER Case of the Month

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65 y/o M with abdominal pain and melena
twice a day for one week

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Patient Presentation

- 65 y/o M with history of melena secondary to stomach ulcer “many years ago” and chronic back pain is admitted to the hospital for intermittent progressive epigastric abdominal pain with associated melena for one week.
- Patient reported hard dark black stools two times a day.
- Patient smokes 5 cigars daily and drinks two 16 oz beers daily. Denies NSAID use, chest pain, nausea, vomiting, hematemesis, coffee-ground emesis, syncope, GERD, and diverticulitis.
- In the emergency department, the patient was tachycardic in the 110s, and his hemoglobin level fell from 11.3 to 8.1 gm/dL.
- Abdomen was rigid, guarded, and was diffusely tender to palpation with rebound.

Patient Presentation

- **Differential Diagnosis**
 - Peptic Ulcer Perforation
 - Gastritis
 - Abdominal Aortic Aneurysm Rupture
 - Acute Pancreatitis
 - Gastric Malignancy

What Imaging Should We Order?

Applicable ACR Appropriateness Criteria

Variant 1:

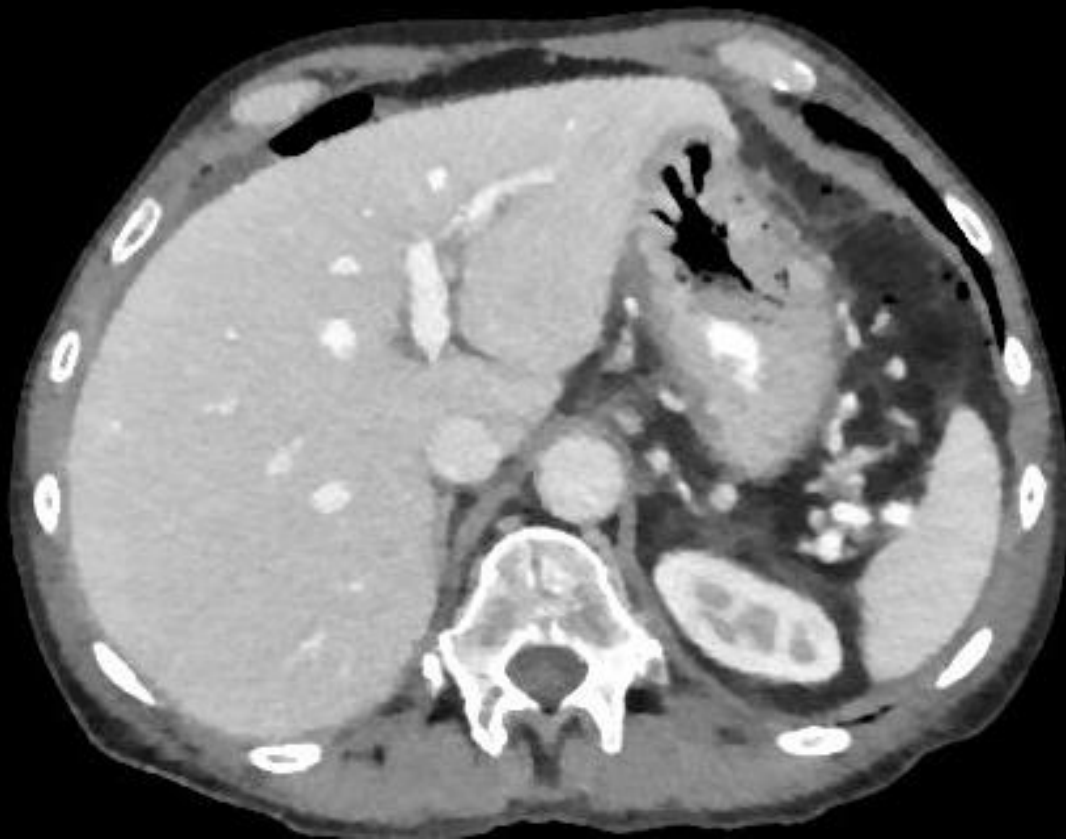
Epigastric pain with clinical suspicion for acid reflux or esophagitis or gastritis or peptic ulcer or duodenal ulcer. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
Fluoroscopy biphasic esophagram	Usually Appropriate	☼☼☼
Fluoroscopy upper GI series	Usually Appropriate	☼☼☼
Fluoroscopy single contrast esophagram	May Be Appropriate	☼☼☼
CT abdomen and pelvis with IV contrast	May Be Appropriate	☼☼☼
CT abdomen and pelvis without IV contrast	May Be Appropriate	☼☼☼
CT abdomen with IV contrast	May Be Appropriate (Disagreement)	☼☼☼
MRI abdomen without and with IV contrast	Usually Not Appropriate	○
MRI abdomen without and with IV contrast with MRCP	Usually Not Appropriate	○
MRI abdomen without IV contrast	Usually Not Appropriate	○
MRI abdomen without IV contrast with MRCP	Usually Not Appropriate	○
CT abdomen without IV contrast	Usually Not Appropriate	☼☼☼
CT abdomen and pelvis without and with IV contrast	Usually Not Appropriate	☼☼☼☼
CT abdomen with IV contrast multiphase	Usually Not Appropriate	☼☼☼☼
CT abdomen without and with IV contrast	Usually Not Appropriate	☼☼☼☼
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☼☼☼☼



This imaging modality was ordered by the ER physician

Findings: (unlabeled)



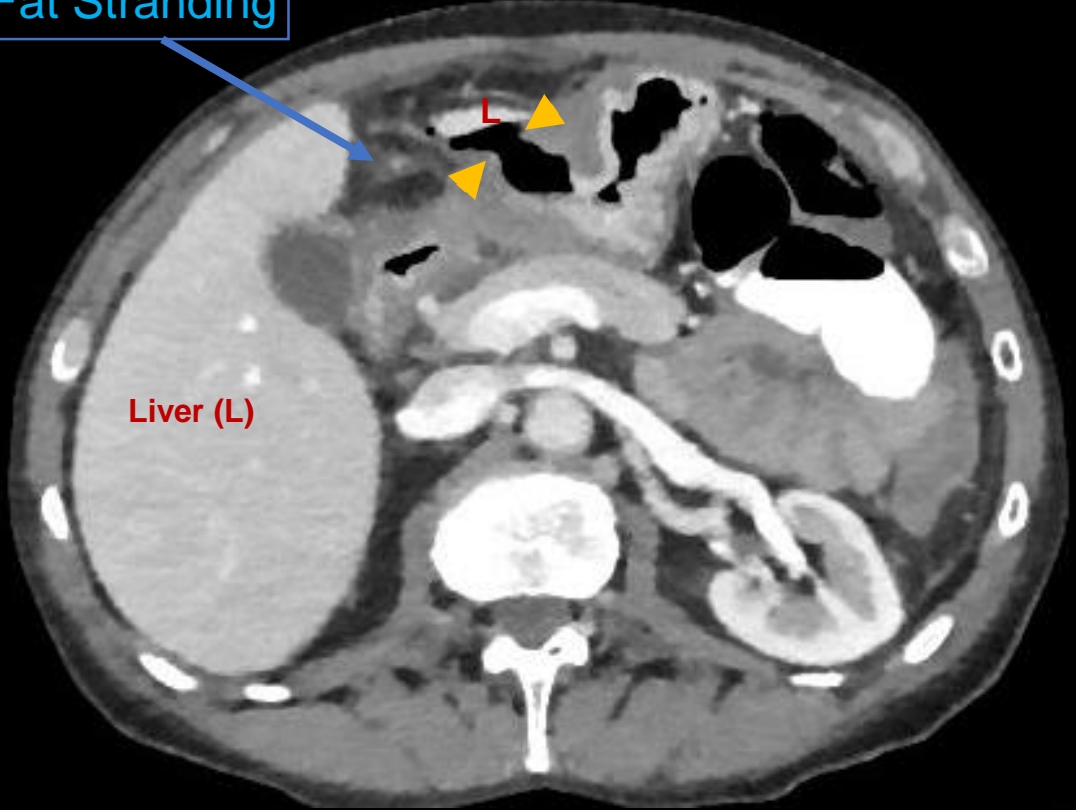
Findings: (labeled)

Free fluid and air



Full thickness defect of thickened gastric wall represents penetrating ulcer (arrowheads)

Fat Stranding



Liver (L)

Final Dx:

Perforated Gastric Ulcer Secondary to Peptic Ulcer
Disease

Discussion: Peptic Ulcer Disease

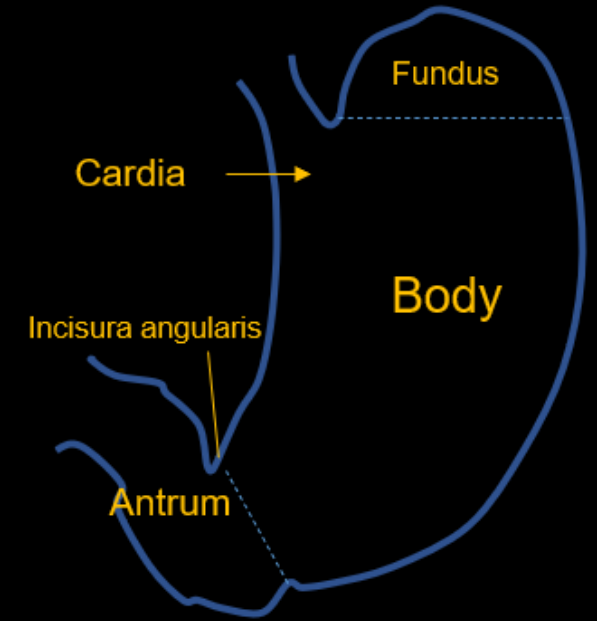
- Peptic Ulcer Disease (PUD) is a common disease that affects 8.4% of the US Population.
- Most cases of PUD are associated with *Helicobacter pylori* infection or chronic NSAID or aspirin use. Other risk factors include smoking, malignancy, Crohn disease, cytomegalovirus, and cocaine use.
- PUD is most likely caused by either an increase in gastric acid secretion or a breakdown of the gastric mucosa.
- Complications include gastrointestinal bleeding, perforation, gastric outlet obstruction, or ulcer penetration into the pancreas, biliary tracts, liver, colon, or vasculature.
- Gastric ulcers often present with post-prandial epigastric pain, nausea, vomiting, dyspepsia, early satiety, melena, and/or hematemesis.
- Perforation of a peptic ulcer should be suspected if there is abdominal distention, guarding, tenderness to palpation, and rebound tenderness.

Peptic Ulcer Disease: Diagnosis and Treatment

- Patients < 50 years old with PUD and without alarming features do not need EGD and can be tested for *H. pylori* using urea breath test or a stool antigen test.
- Esophagogastroduodenoscopy (EGD) provides the definitive diagnosis for PUD.
 - EGD is recommended for patients > 50 years old or if alarming features such as unintended weight loss, iron deficiency anemia, or abnormal abdominal imaging are present.
 - Testing for *H. pylori* can be done during EGD with rapid urease testing or with biopsy specimens
 - Biopsy is recommended for all gastric ulcers to rule out malignancy. Duodenal ulcers are rarely malignant.
- Treatment consists of stopping NSAID use, proton pump inhibitor therapy for 4-8 weeks, and if *H. pylori* is present, bismuth subsalicylate, macrolide or tetracycline, and nitroimidazole.
- If perforated ulcer is suspected, obtain a stat CT Abdomen and Pelvis and consult surgery.
 - Gastrectomy with bilateral selective vagotomy is the definitive treatment for PUD if the perforation is > 2 cm, if the tissue is too friable to hold sutures, or if a previous ulcer repair fails.

Stomach on CT

- Anatomy : Gastric cardia, Fundus, Body, Antrum
- The incisura angularis, located between the gastric body and antrum is the most common site for gastric ulcers.
- Normal gastric wall thickness:
 - ≤ 5 mm in distended gastric body
 - ≤ 12 mm in antrum (thickest and most muscular gastric wall segment)
- Non distension of the stomach can lead to false positive diagnosis for wall thickening
- CT evaluation of the stomach is limited by incomplete gastric distension, peristalsis and retained food.
- When suspect gastric disease, improve distension by administering a negative oral contrast (such as water), effervescent and hypotonic agents.



Gastric ulcer – CT findings

- Gastric ulcers

- Superficial/Mucosal – not seen on CT
- Deep or penetrating ulcer – may be seen
 - Luminal outpouching
 - Secondary findings:
 - Accompanied gastritis
 - Peri-gastric fat stranding
- Ulcer may be better seen on coronal or sagittal reformatted images

- Gastritis:

- Focal or eccentric wall thickening
- Preservation of mural stratification - mucosal hyperenhancement and submucosal edema/hypodense
- Adjacent fat stranding



Coronal Reformatted Image – 2cm ulcer (arrow) with mural stratification and adjacent fat stranding

Gastric ulcer continued..

- Perforation – most common complication of PUD
 - Anterior wall ulcers – perforate into peritoneal space -> free air
 - Posterior wall ulcers – perforate into lesser sac -> contained
- **CT Findings of PUD perforation**
 - Free air and/or fluid
 - Transmural gastric wall discontinuity (arrow)
 - Extraluminal oral contrast

(as in our patient)



Sagittal Reformatted Image

Differentiation of Benign vs Malignant Ulcer on CT

- Benign vs Malignant Ulcers: No one CT finding is highly sensitive and specific for detecting malignant gastric masses.
- Sensitivity and Specificity in detection of malignant or potentially malignant gastric lesion requiring further diagnostic evaluation
 - Gastric wall thickness ≥ 1 cm had a sensitivity of 100% but specificity of 50%
 - Gastric wall thickness ≥ 2 cm had a sensitivity of 50% but specificity of 88%
 - Focal, eccentric, or enhancing wall thickening: Sens 93%, 71%, 43%; Spec 8%, 75%, 88%
- Chen et al found that an ulcer was more likely malignant if there is thickening of the enhanced ulcer base with loss of normal stratification on multi-detector CT with multiplanar reconstruction

Our Patient's Course

- The patient underwent emergent surgery which confirmed the finding of a perforated anterior gastric antral ulcer measuring 2 cm in diameter. The perforation measured 1 cm in diameter.
- Prior to surgery, the patient expressed their wish not to undergo a definitive ulcer operation, including distal gastrectomy and vagotomy.
- Intraoperatively circumferential full-thickness biopsies at the gastric ulcer were performed with no malignancy detected pathologically.
- A primary repair with a Graham patch was completed and two Jackson Pratt drains were placed for post-surgical clearance of fluid.
- IHC stain for *Helicobacter pylori* demonstrated abundant particulate debris likely representing fragmented / degenerating *H. pylori*.
- Patient was discharged 7 days after laparotomy on bismuth quadruple therapy for *H. pylori*

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