AMSER Rad-Path Case of the Month:

72-year-old female with severe abdominal pain, nausea, vomiting, and abdominal distension

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Patient Presentation

HPI:

- 72 Year old female presented to the ED for evaluation of abdominal pain, nausea, and vomiting ongoing for the past 24 hours
- Negative for hematemesis, blood in stool, constipation and diarrhea

Physical Exam:

- Abdominal examination revealed diffuse tenderness in the right lower quadrant, epigastric area, left upper quadrant and left lower quadrant.
- There is guarding and rebound.

Patient Presentation

PMHx & PSHx:

- The patient has a background of gastroesophageal reflux disease, hyperlipidemia, and osteoporosis.
- No previous history of abdominal surgery

Abnormal Labs	
Lactate	**8.9 (0.5 - 1.6 mm/L)**
Arterial pH	**7.17 (7.35 - 7.45)**
BUN	**35 (6 - 24 mg/dl)**
GFR Estimate	**28 ($\geq$90 mL/min/1.73m^2)**

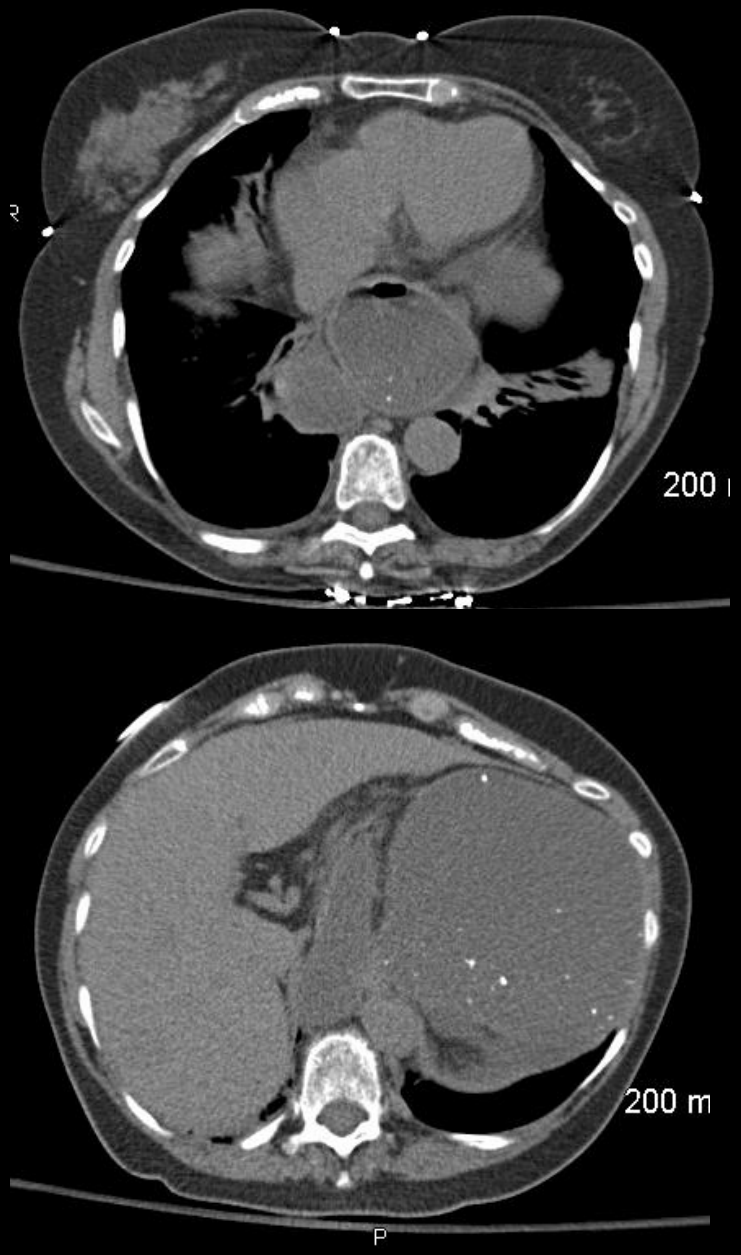
What Imaging Should We Order?

Select the applicable ACR Appropriateness Criteria

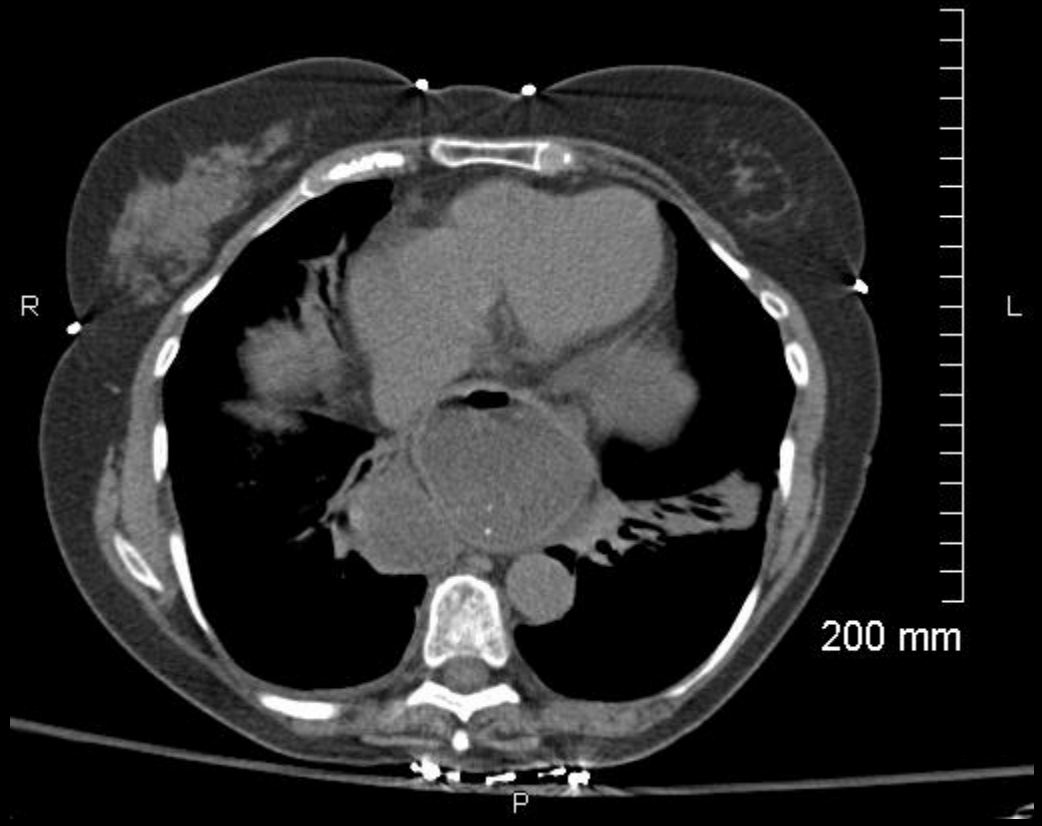
Variant 4: **Acute nonlocalized abdominal pain. Not otherwise specified. Initial imaging.**

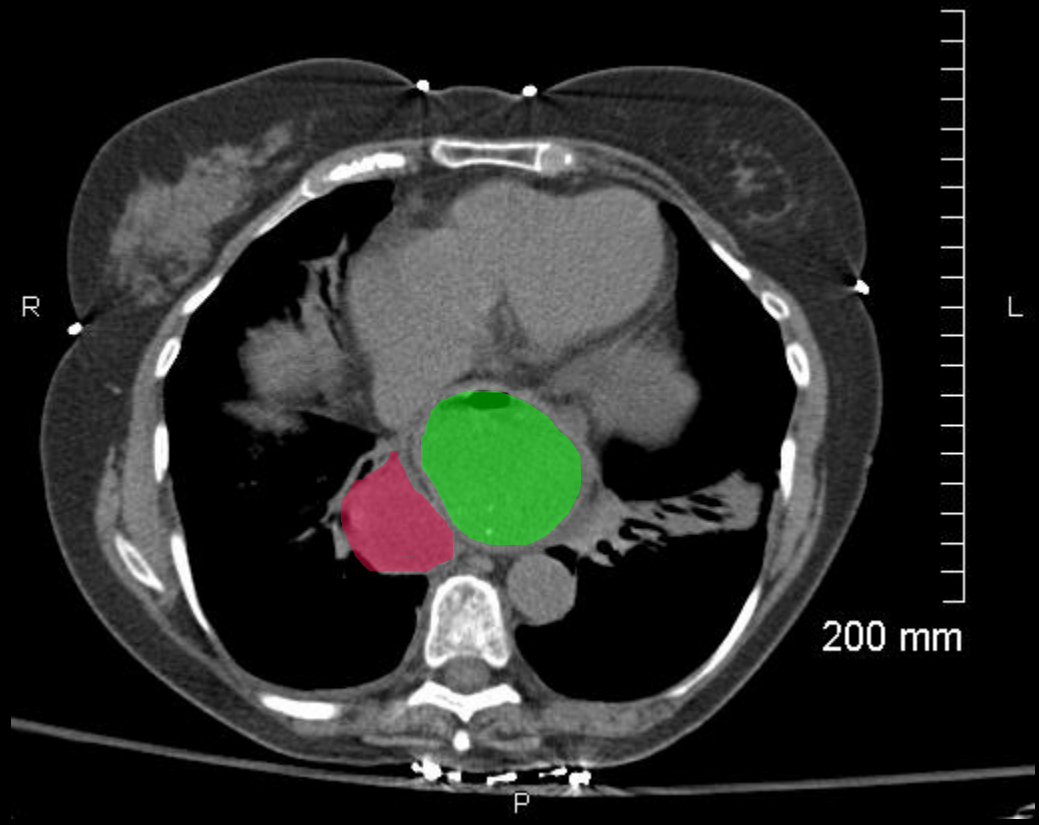
Procedure	Appropriateness Category	Relative Radiation Level
CT abdomen and pelvis with IV contrast	Usually Appropriate	☢☢☢
CT abdomen and pelvis without IV contrast	Usually Appropriate	☢☢☢
MRI abdomen and pelvis without and with IV contrast	Usually Appropriate	O
US abdomen	May Be Appropriate	O
MRI abdomen and pelvis without IV contrast	May Be Appropriate	O
CT abdomen and pelvis without and with IV contrast	May Be Appropriate	☢☢☢☢
Radiography abdomen	May Be Appropriate	☢☢
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☢☢☢☢
WBC scan abdomen and pelvis	Usually Not Appropriate	☢☢☢☢
Nuclear medicine scan gallbladder	Usually Not Appropriate	☢☢
Fluoroscopy upper GI series with small bowel follow-through	Usually Not Appropriate	☢☢☢
Fluoroscopy contrast enema	Usually Not Appropriate	☢☢☢

Abdominal/Pelvic CT Without Contrast (Unlabeled)



Abdominal/Pelvic CT Without Contrast (Labeled)





Axial CT image through the lower thorax in soft tissue window demonstrating dilated distal esophagus (red overlay) and paraesophageal hiatal hernia of gastric antrum (green overlay)

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Abdominal/Pelvic CT Without Contrast (Labeled)

Axial CT image at the level of the liver in soft tissue window of dilated distal esophagus and GE junction in expected location (red overlay) with gastric antrum displaced superiorly and leftward (green overlay).

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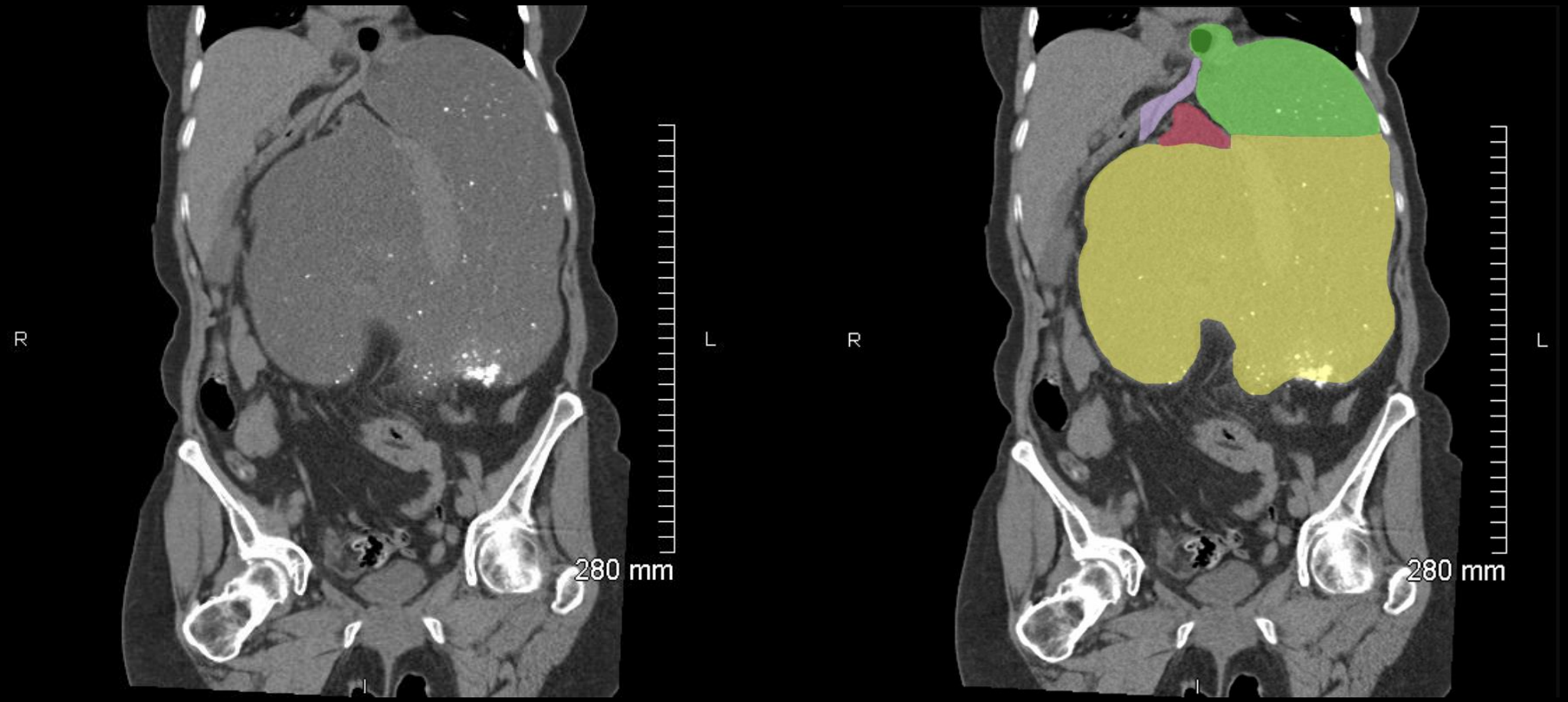
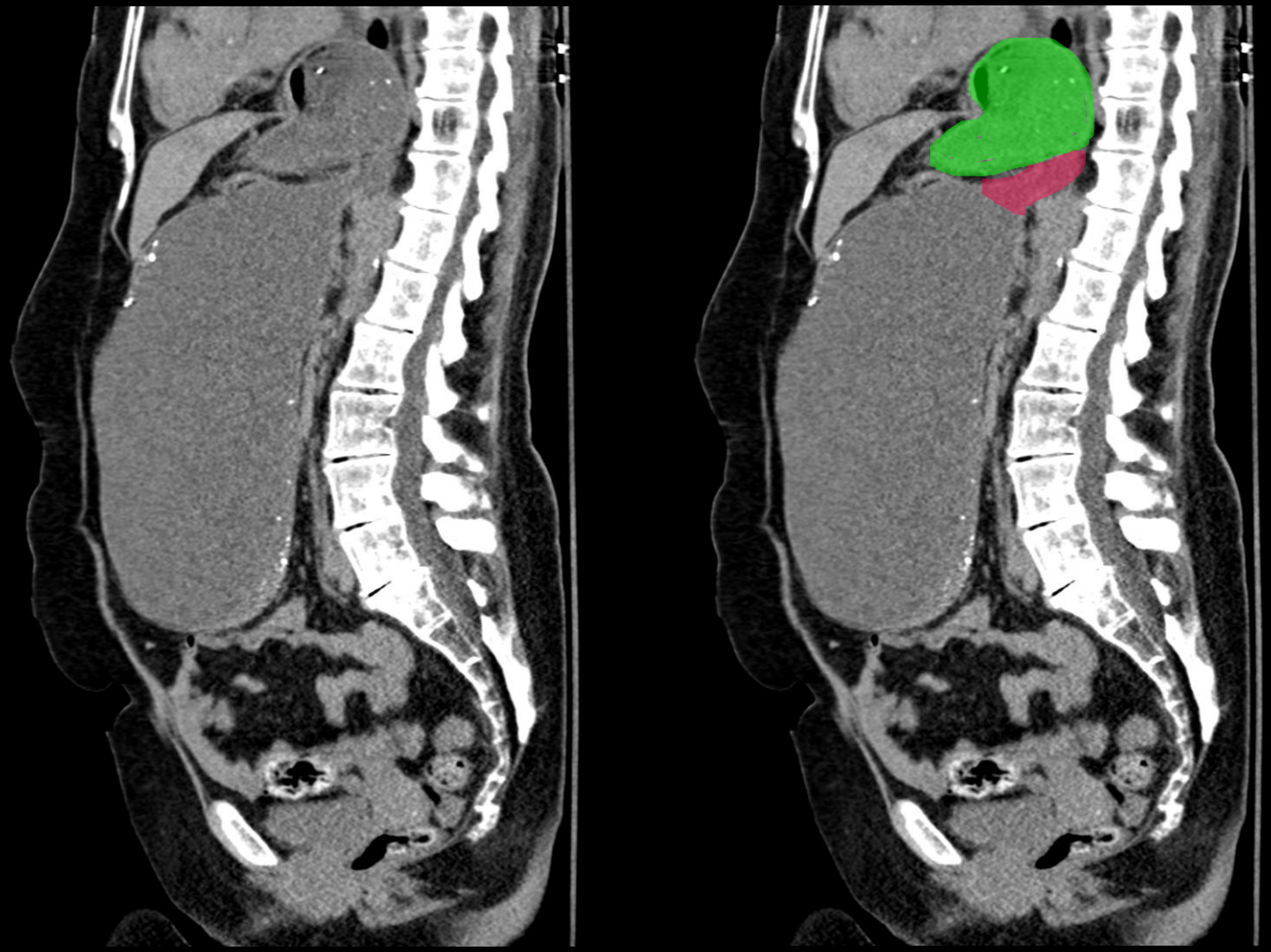
Abdominal/Pelvic CT Without Contrast (Labeled)



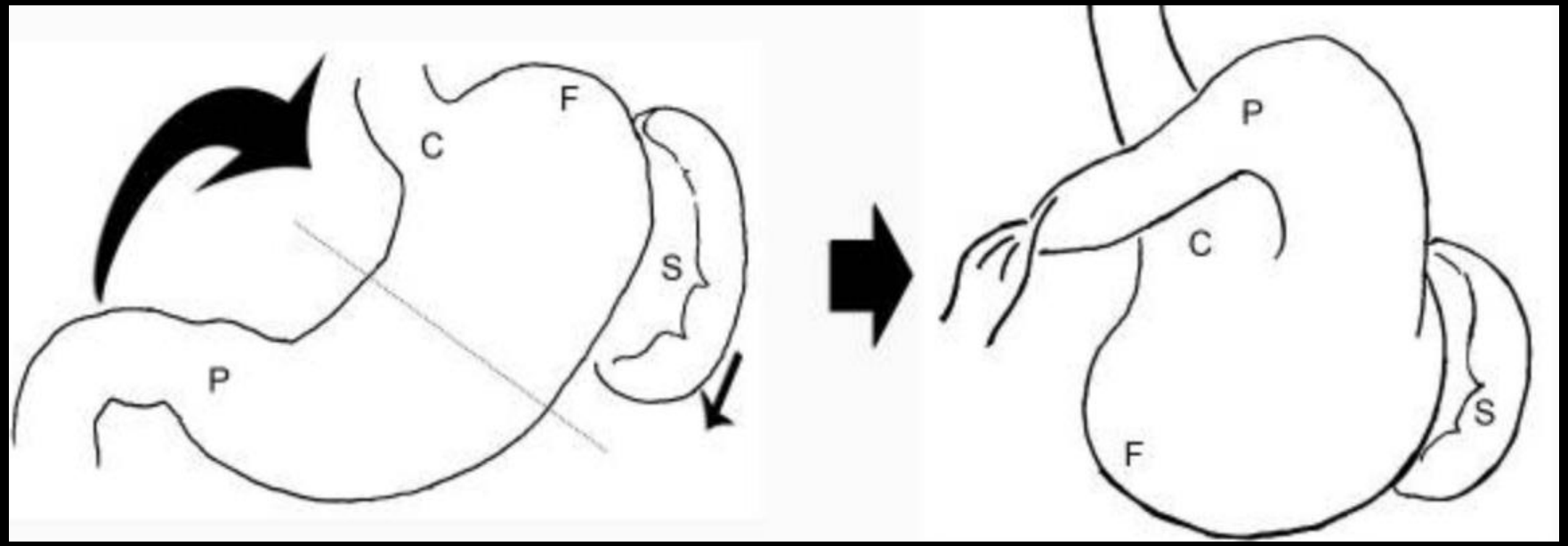
Coronal CT image in soft tissue window demonstrates the antrum and pylorus of the stomach displaced superiorly within a paraesophageal hernia (green overlay). The esophagus (red overlay) is seen inferior to a collapsed duodenum (purple overlay). The gastric fundus (yellow overlay) is inferiorly displaced.

Abdominal/Pelvic CT Without Contrast (Labeled)



Midline sagittal CT image reveals the esophagus (red overlay) inferior to the gastric antrum and pylorus (green overlay).

Final Dx:
Mesentero-axial Gastric Volvulus



Woon, Colin Yi-Loong, et al. “Delayed Diagnosis of Intermittent Mesenteroaxial Volvulus of the Stomach by Computed Tomography: a Case Report.” *Journal of Medical Case Reports*, vol. 2, no. 1, 2008, p. 343.

Mesentero-axial Gastric Volvulus

Basics

- A gastric volvulus is an abnormal rotation of the stomach of more than 180 degrees leading to a closed loop obstruction. Volvulus is most common in children although it can occur at any age, with equal frequency in both men and women [3].
- Depending upon the axis of which the stomach rotates, an acute volvulus may either be organo-axial, mesentero-axial, or a combination of the two. A mesentero-axial volvulus rotates around a transverse axis connecting the greater and lesser curvatures [3].

Risk Factors

- Anatomic factors that lead to abnormal stomach mobility are associated with an increased risk of intraabdominal volvulus.

Mesentero-axial Gastric Volvulus

Clinical Features

- In contrast to this patient, acute gastric volvulus typically presents with epigastric pain, retching without vomiting, and inability to pass nasogastric tube. This collection of symptoms is known as Borchardt's Triad.

Radiographic Features

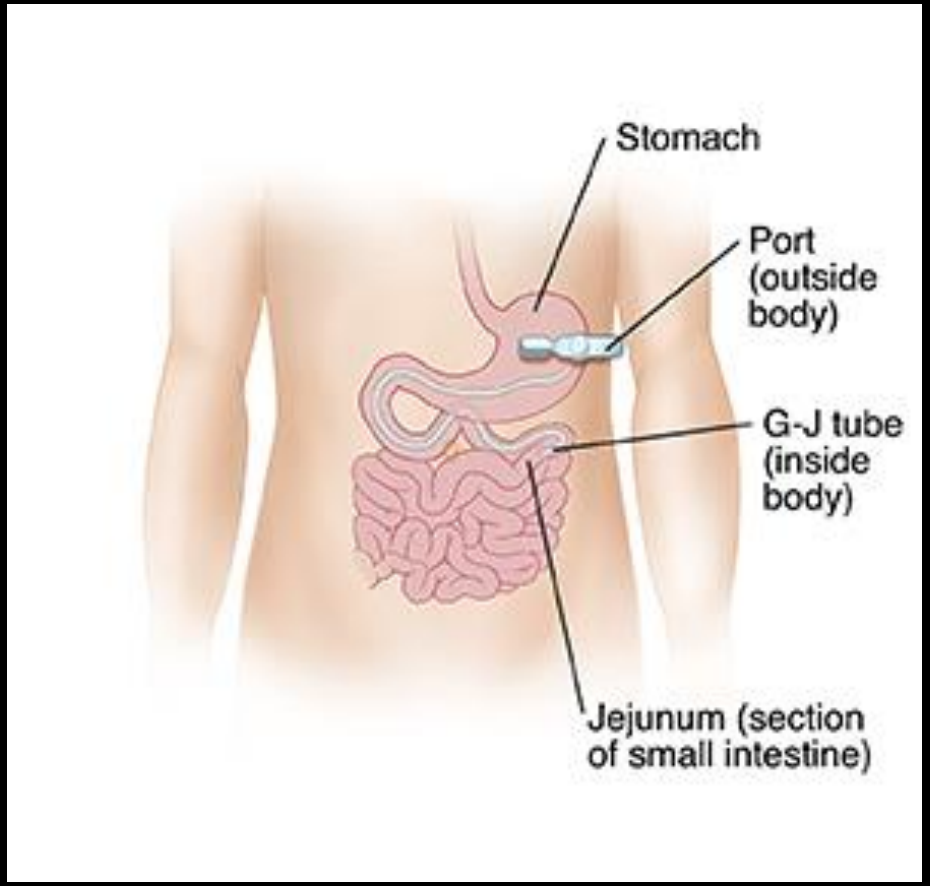
CT of the abdomen and pelvis is highly specific and sensitive for diagnosing gastric volvulus. The results of a recent study show that the transition point at the pylorus is the most sensitive (70-80%) and specific (100%) CT finding for gastric volvulus diagnosis [2].

Treatment

- Imaging, along with an elevated lactate and hemodynamic instability, suggest necrosis of strangulated tissue within the paraoesophageal hernia
- The patient was intubated and transferred to the ICU
- Within the ICU Esophagogastroduodenoscopy demonstrated dusky appearance of the gastric cardia, body, and fundus consistent with necrosis requiring surgical intervention

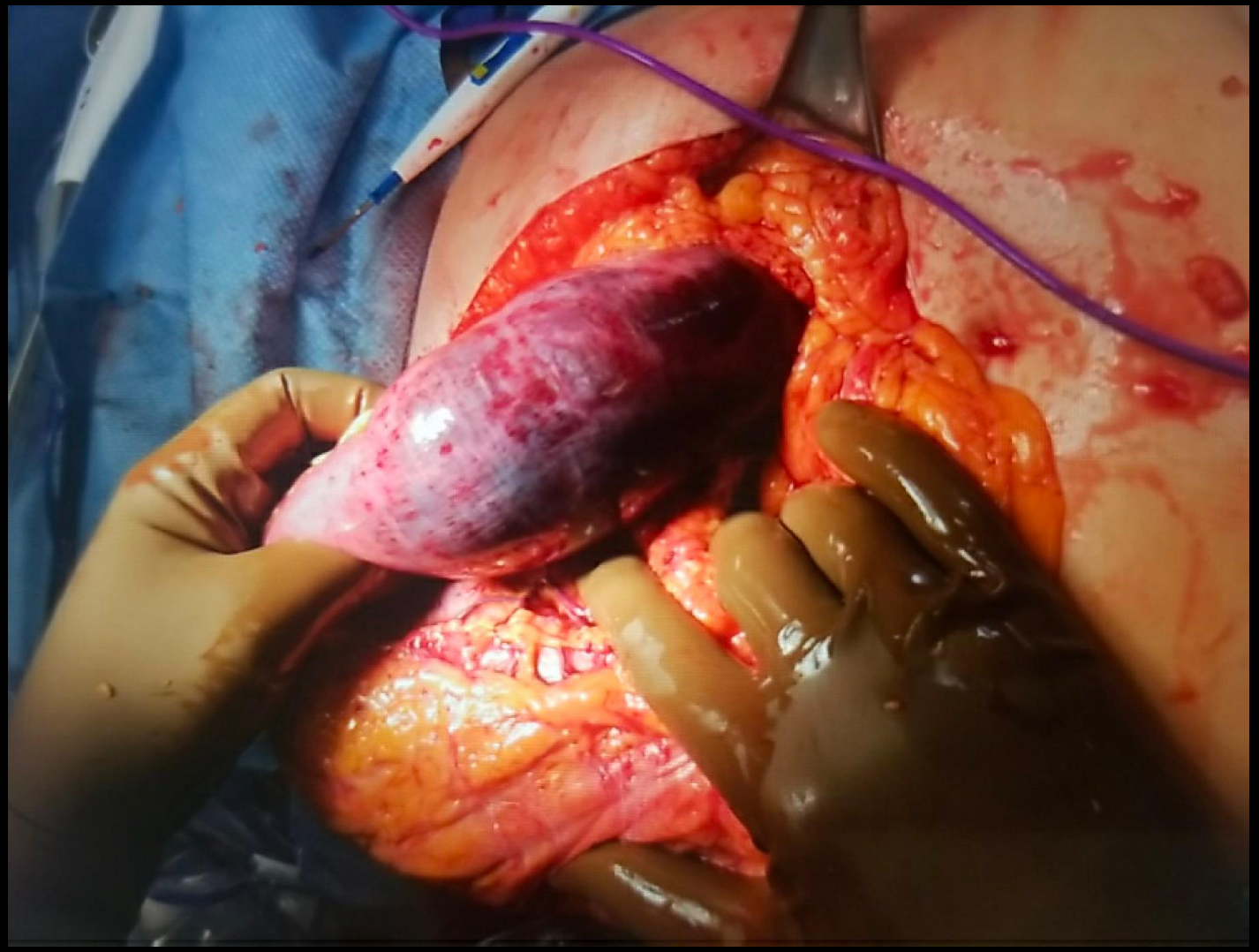
Treatment

- The hiatal hernia was surgically reduced, and mesh was placed over the hiatal defect.
- Necrotic tissue was removed via stomach wedge resection and sent to pathology
- Following the reduction, a gastrotomy was performed and a Gastrostomy-Jejunostomy tube was inserted through the abdominal wall. The G-J tube was guided through the pylorus into the second portion of the duodenum.
- The stomach was then decompressed and tacked to the abdominal wall and the G-J tube balloon was filled with 8cc fluid.



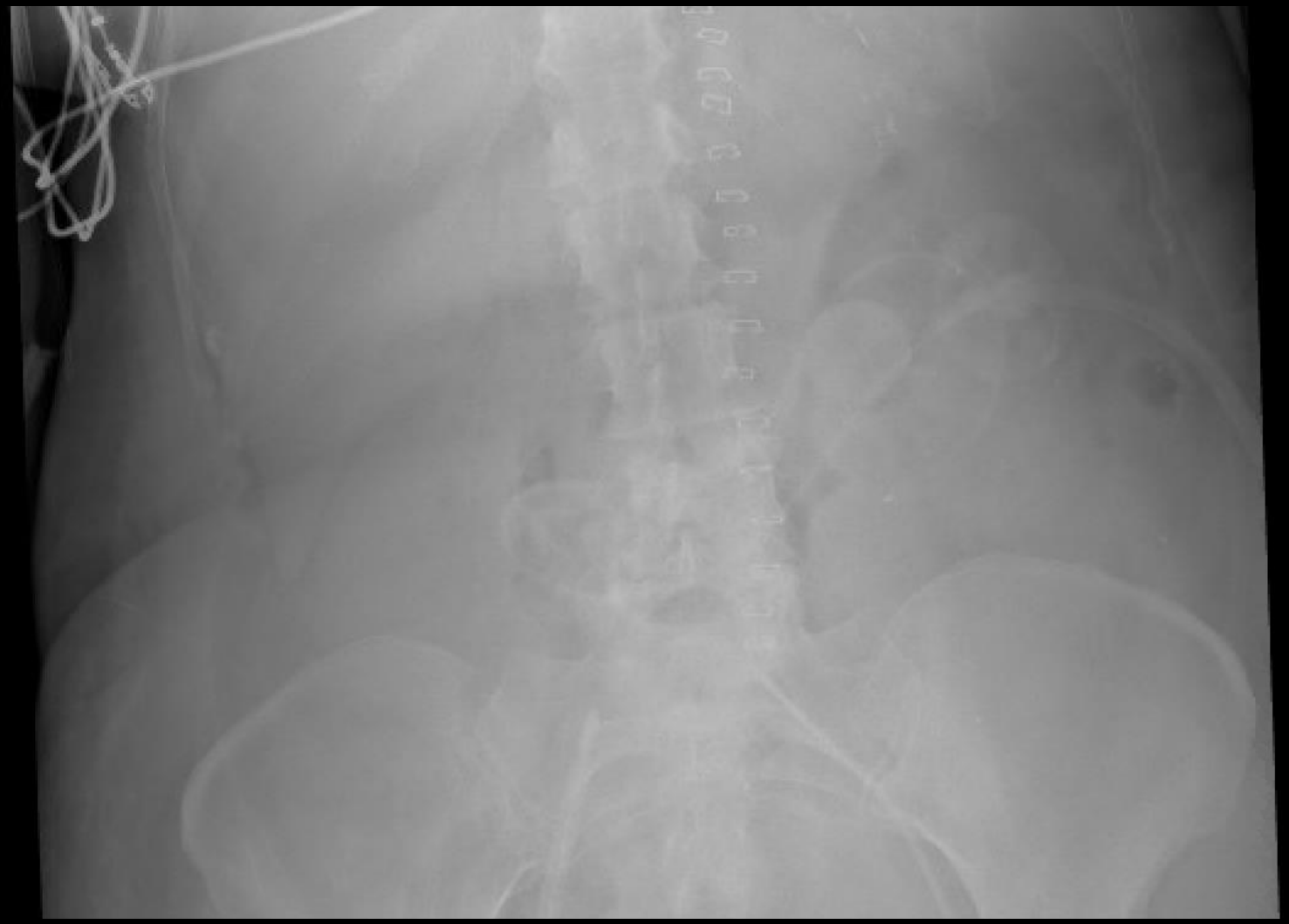
"Your Gastro-Jejunum (G-J) Tube." *Saint Luke's Health System*, www.saintlukeskc.org/health-library/your-gastro-jejunum-g-j-tube. Accessed 30 July 2023.

Gross Images

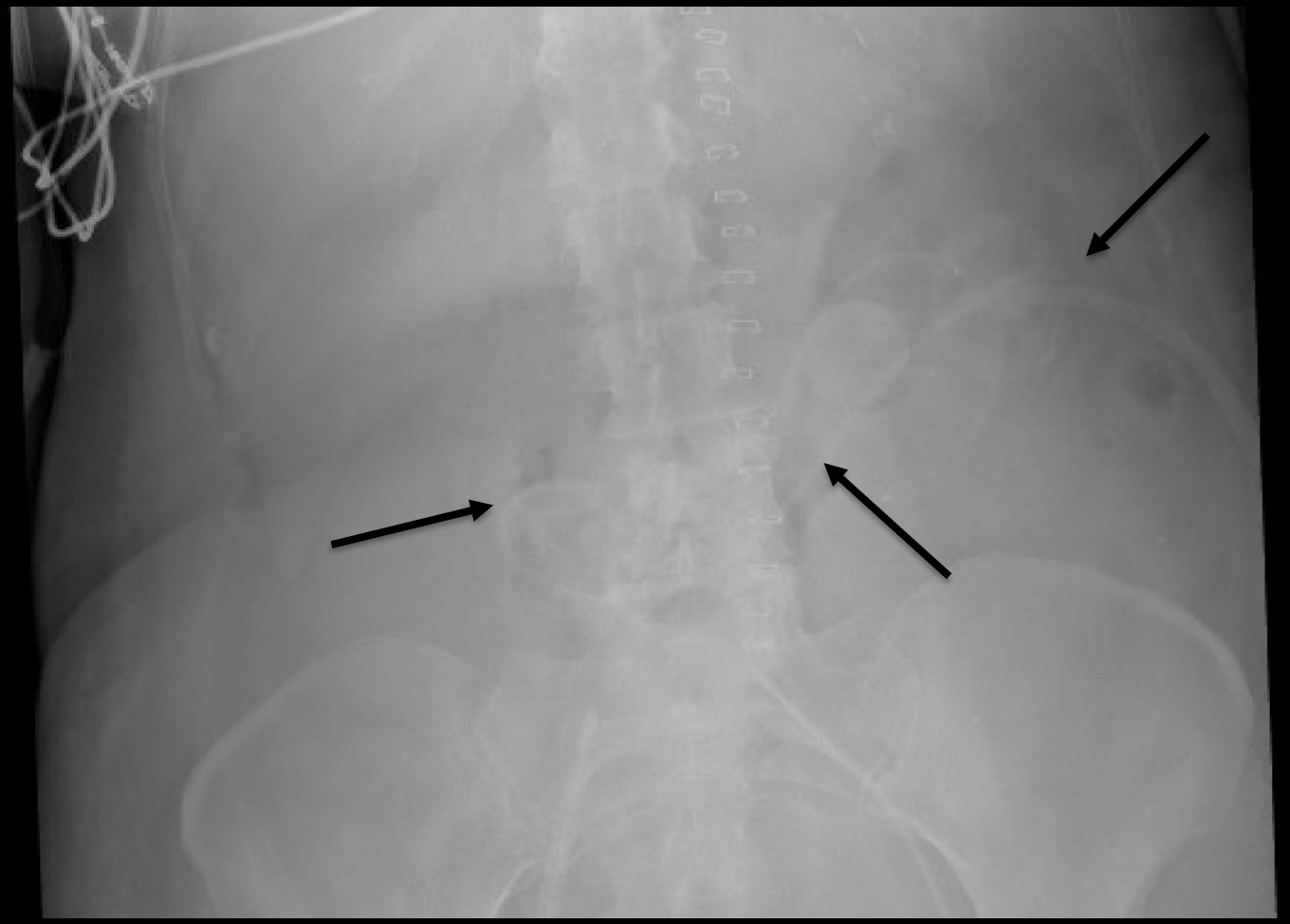


Intraoperative stomach decompression

Chest X-ray (Unlabeled)

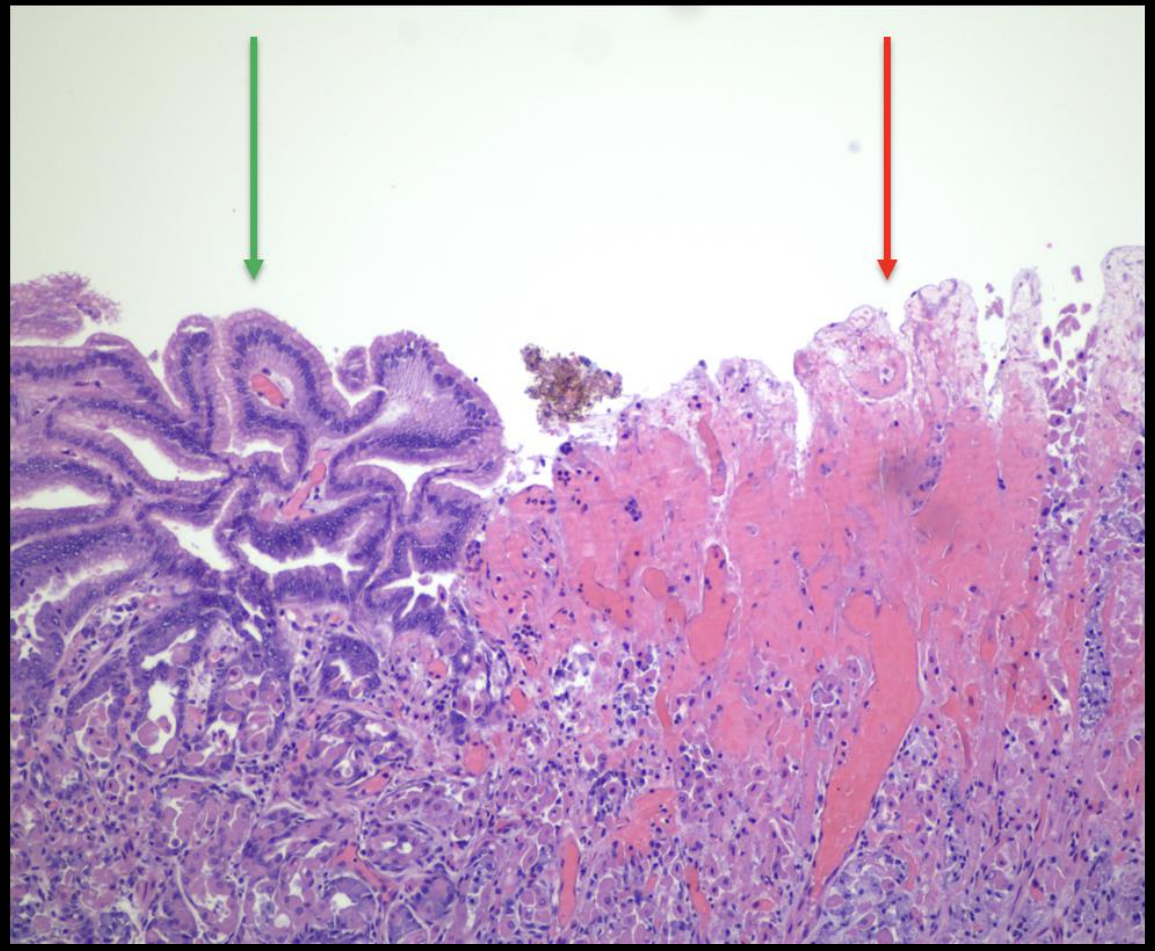


Chest X-ray (Labeled)

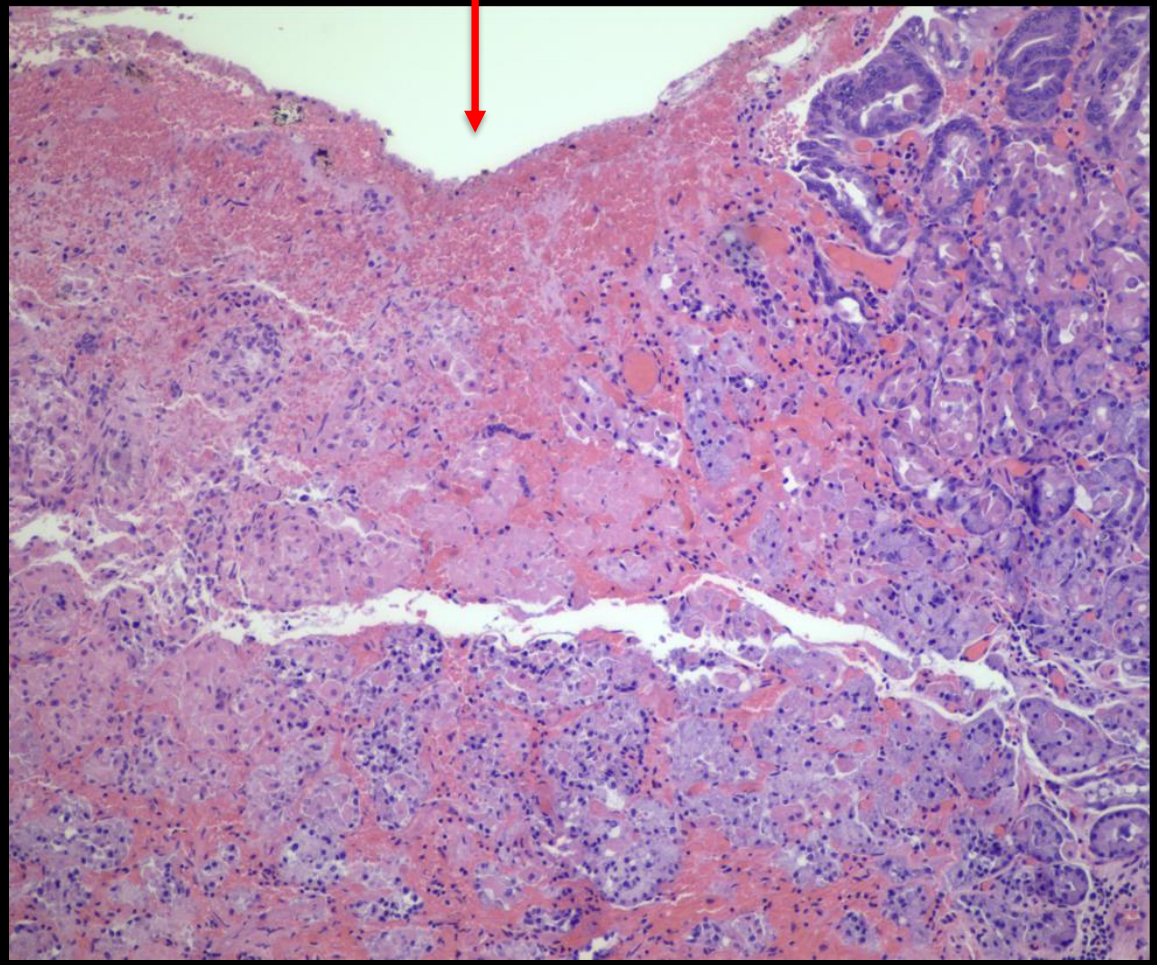


Post Operative Abdominal X-ray showing G-J tube placement (black arrows) and a paucity of bowel gas without evidence of obstruction

Pathology (Labeled)



Superficial mucosal ischemic change with adjacent normal-appearing gastric mucosa (100x)



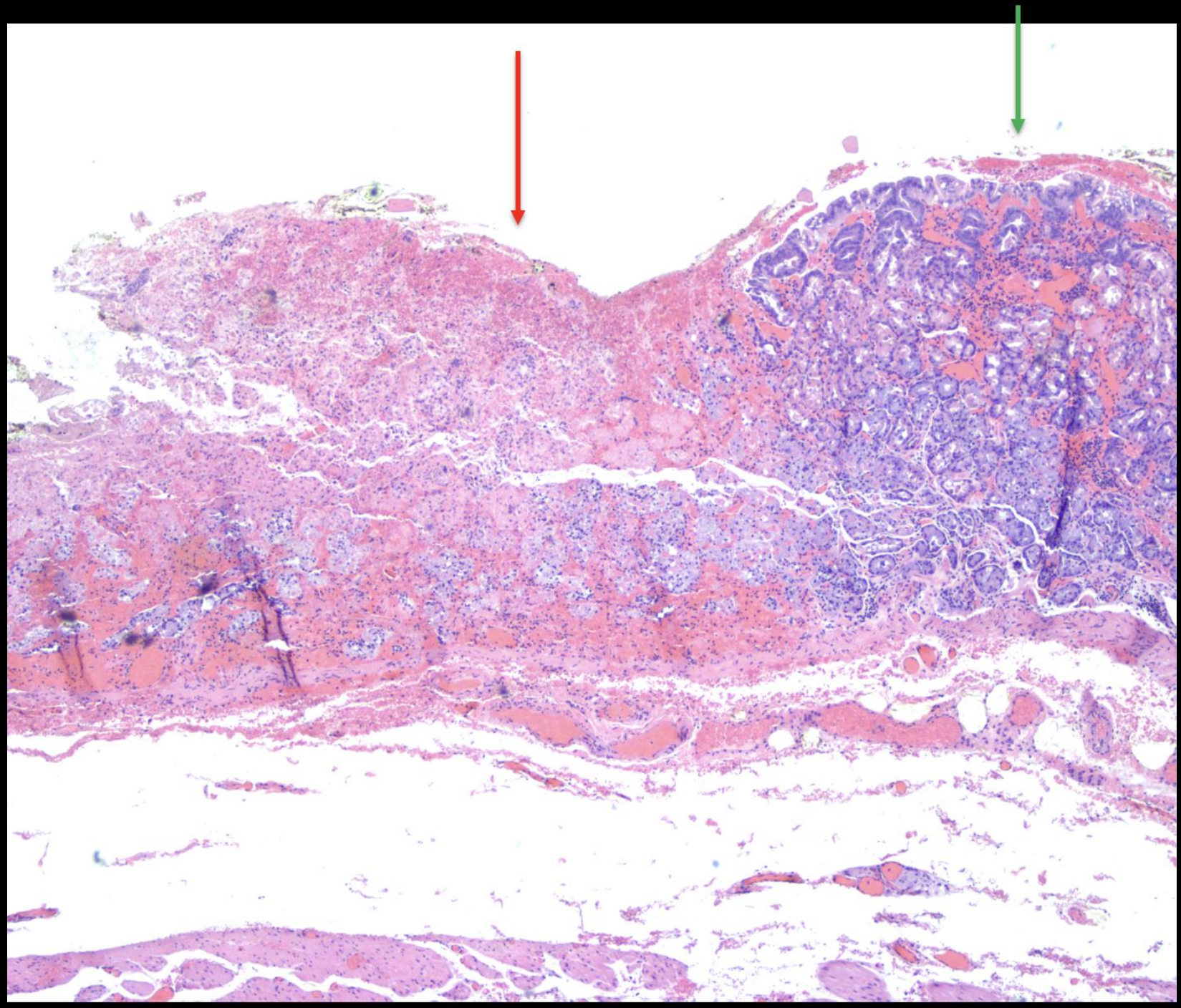
Ischemic gastric mucosa (100x)

Ischemia characterized by eosinophilic coloration due to protein denaturation

Pathology (Labeled)

Low-power view of diffuse mucosal ischemic necrosis with adjacent viable gastric mucosa on the right side of the photomicrograph (40x)

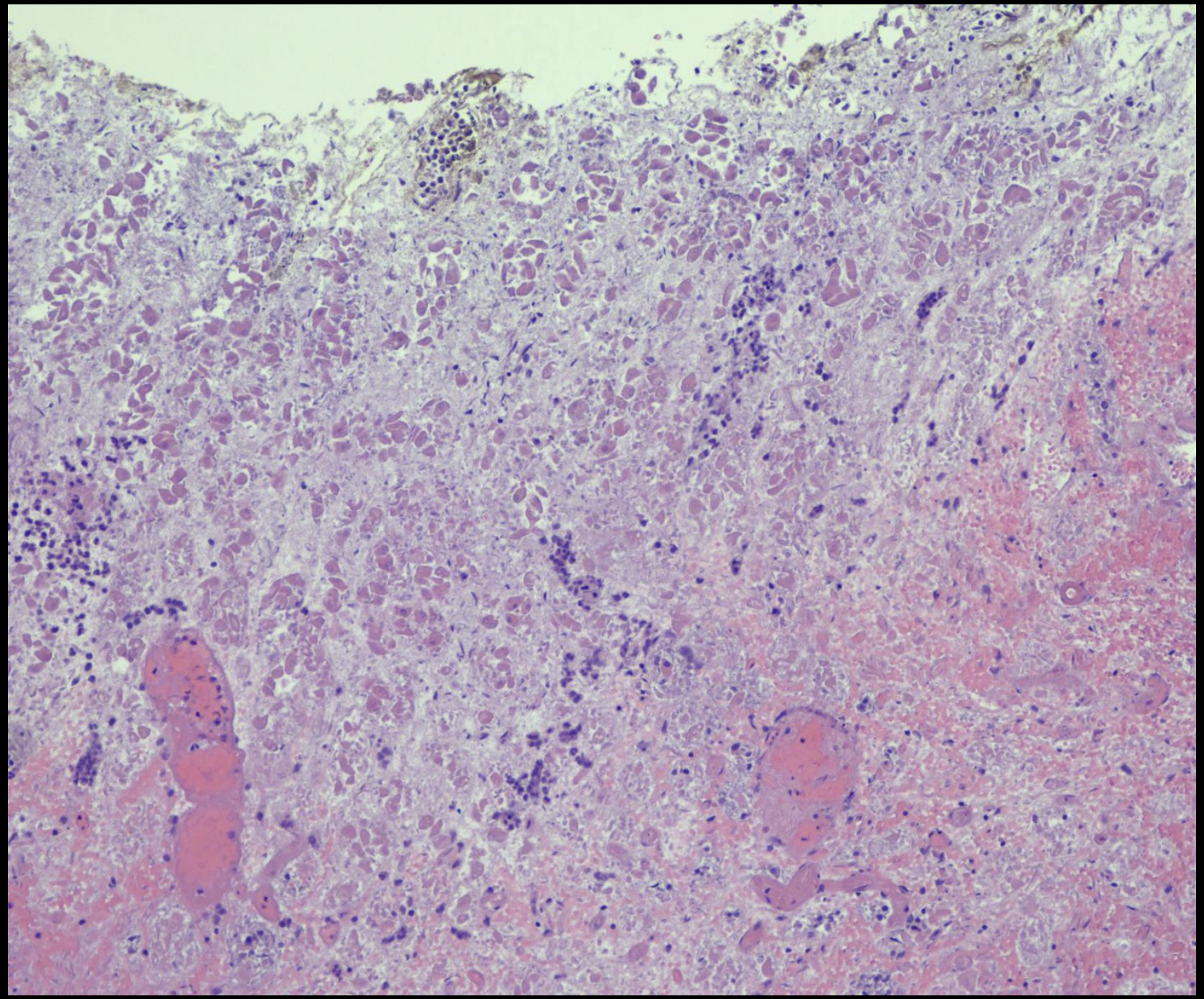
Normal appearing gastric mucosa showcases basophilic glandular architecture



Pathology (Labeled)

Severe diffuse mucosal ischemic necrosis (100x)

Histology shows diffuse eosinophilic staining and loss of glandular architecture which represents protein denaturation and diffuse cellular necrosis due to ischemia



Case Discussion: Pathology

- Stomach wedge resections show coagulative necrosis of the gastric mucosa due to ischemia
- Microscopic appearance illustrates preserved cellular architecture with concomitant cellular swelling
  - Cellular swelling is caused by failure of the sodium potassium pump to excrete sodium resulting in an influx of H_2O
- Lack of oxygen and ATP leads to a decreased pH secondary to anaerobic metabolism. This decreased pH leads to denaturation of proteins within the cells
- Necrosis appears eosinophilic on H&E slides due to binding of eosin stain to the denatured cellular proteins

References:

1. *Acute Nonlocalized Abdominal Pain - Acsearch.Acr.Org*, acsearch.acr.org/docs/69467/Narrative. Accessed 23 July 2023.

2. Danielpour, Payman J, et al. “RADIOLOGICAL CASE OF THE MONTH.” *Applied Radiology (1976)*, vol. 36, no. 1, 2007, p. 39.

3. Mazaheri, Parisa, et al. “CT of Gastric Volvulus: Interobserver Reliability, Radiologists' Accuracy, and Imaging Findings.” *American Journal of Roentgenology (1976)*, vol. 212, no. 1, 2019, pp. 103–108.

4. Singham, S, and B Sounness. “Mesenteroaxial Volvulus in an Adult: Time Is of the Essence in Acute Presentation.” *Biomedical Imaging and Intervention Journal*, vol. 5, no. 3, 2009, p. e18.

5. St-Amant, Maxime. “Mesentero-Axial Gastric Volvulus: Radiology Case.” *Radiopaedia Blog RSS*, Radiopaedia.org, 23 Nov. 2022, https://radiopaedia.org/cases/mesentero-axial-gastric-volvulus-1?lang=us.

6. Woon, Colin Yi-Loong, et al. “Delayed Diagnosis of Intermittent Mesenteroaxial Volvulus of the Stomach by Computed Tomography: a Case Report.” *Journal of Medical Case Reports*, vol. 2, no. 1, 2008, p. 343.

7. “Your Gastro-Jejunum (G-J) Tube.” *Saint Luke’s Health System*, www.saintlukeskc.org/health-library/your-gastro-jejunum-g-j-tube. Accessed 30 July 2023.

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