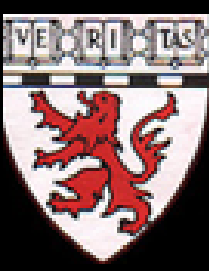




# Don't Forget the Duodenum: Imaging Spectrum of Duodenal Emergencies



Babina Gosangi MD, Tatiana Rocha MD, Jennifer Uyeda, MD, Maaz Ghouri MD, Alejandra Duran- Mendicuti MD

Emergency Radiology, Brigham and Women's Hospital, Boston, MA

**Target Audience:** Any radiologist or radiology trainee interpreting abdominal CTs.

## **Goals:**

- To briefly review the anatomy of the duodenum with emphasis in its particular relationships with adjacent structures.
- To briefly describe the role of imaging in duodenal emergencies: upper GI series, MDCT scan including Dual Energy CT.
- To review duodenal emergencies in a systematic manner based on etiology with case examples.

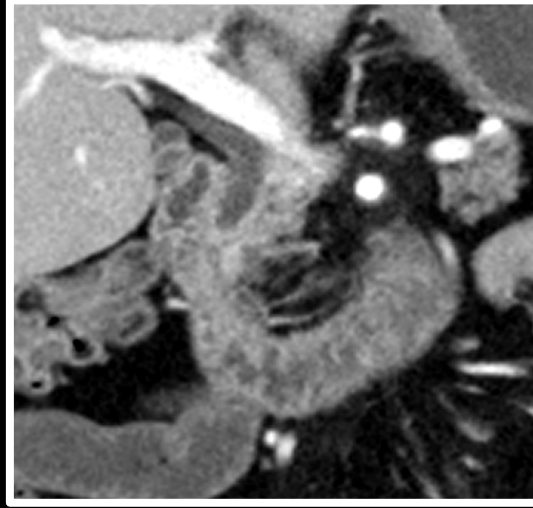
# Anatomy of the Duodenum

1<sup>st</sup> part of Duodenum



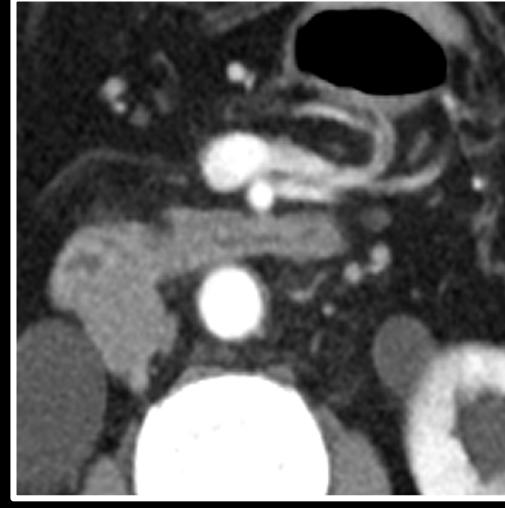
- Superior
- From pylorus to duodenal flexure
- IVC, CBD and portal vein lie posteriorly
- Only first 2-3 cm intraperitoneal

2<sup>nd</sup> part of Duodenum



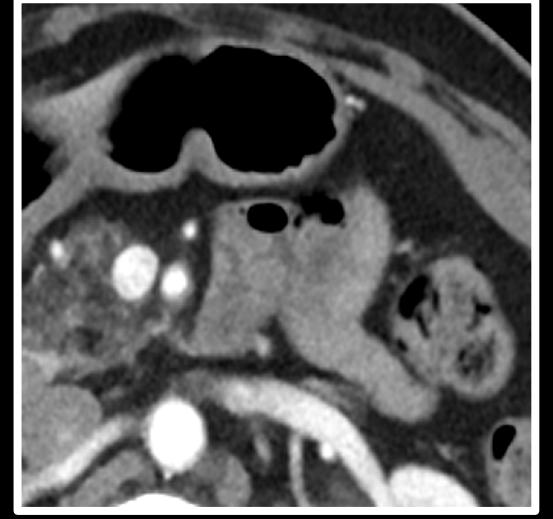
- Descending
- Lateral to the head of pancreas
- CBD and pancreatic duct openings

3<sup>rd</sup> part of Duodenum



- Horizontal
- Between the aorta and SMA. Close to vertebra.
- Most prone to trauma.

4<sup>th</sup> part of Duodenum



- Ascending
- On left side of the aorta and posterior to the stomach

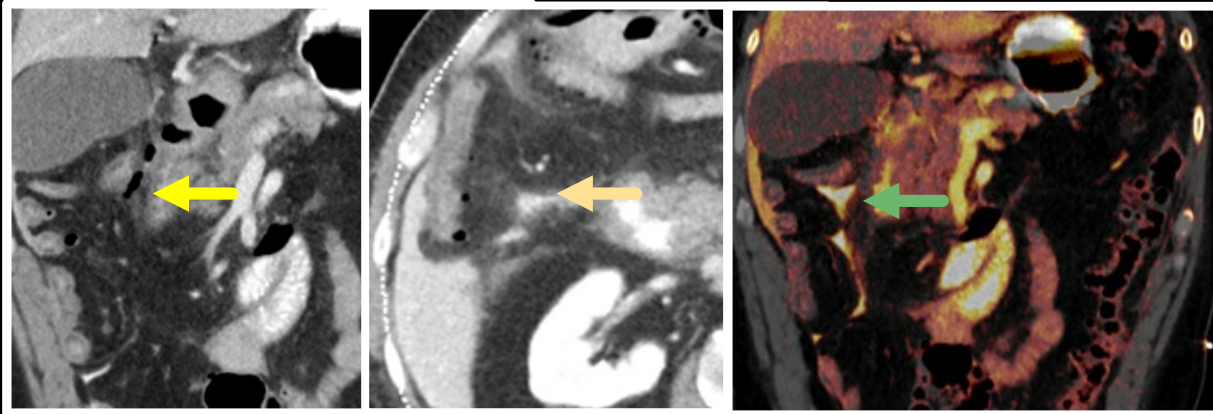
## Imaging Modalities

- MDCT is the modality of choice for duodenal emergencies. Dual-energy CT iodine maps are useful in showing site of acute bleeding or underlying enhancing mass.
- Barium studies can confirm site of perforations and fistulization.
- MRI has a limited role in the emergency setting.

# Peptic Ulcer Disease

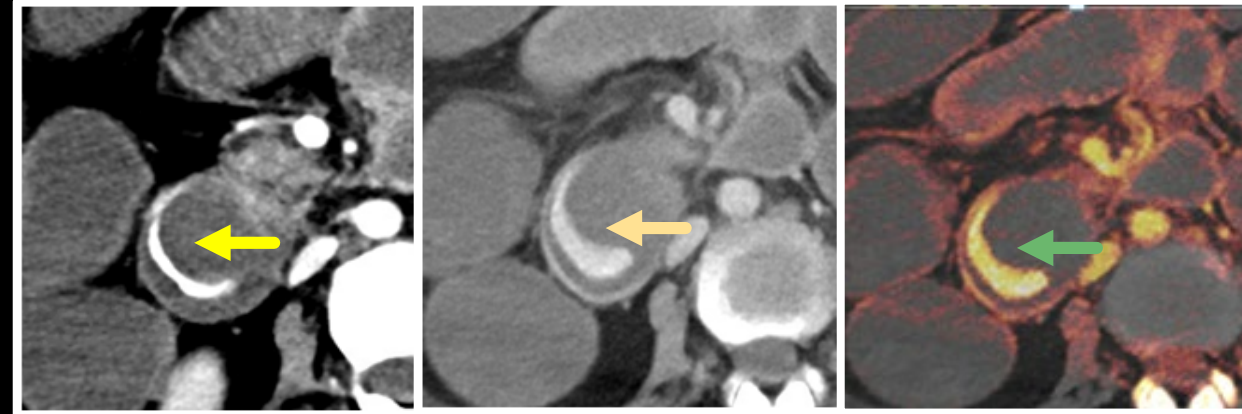
- Duodenal ulcers can be diagnosed by endoscopy or fluoroscopy (pocket of Barium filling a crater).
- CT findings of non complicated peptic disease: focal wall thickening with adjacent fat stranding.
- CT findings of perforated ulcer : pneumoperitoneum, focal fat stranding, discontinuity of the mucosa and/or luminal outpouching (site of ulcer crater).
- If bleeding ulcer, high attenuation material can be noted within or surrounding the duodenum with active contrast extravasation on contrast enhanced exams.

## Perforated Ulcer



CT in an 81-year-old female shows free air (yellow arrow) and extravasation of oral contrast (orange arrow) along the second part of duodenum. Extraluminal contrast is better seen on dual energy CT (green arrow)

## Hemorrhage from Ulcer

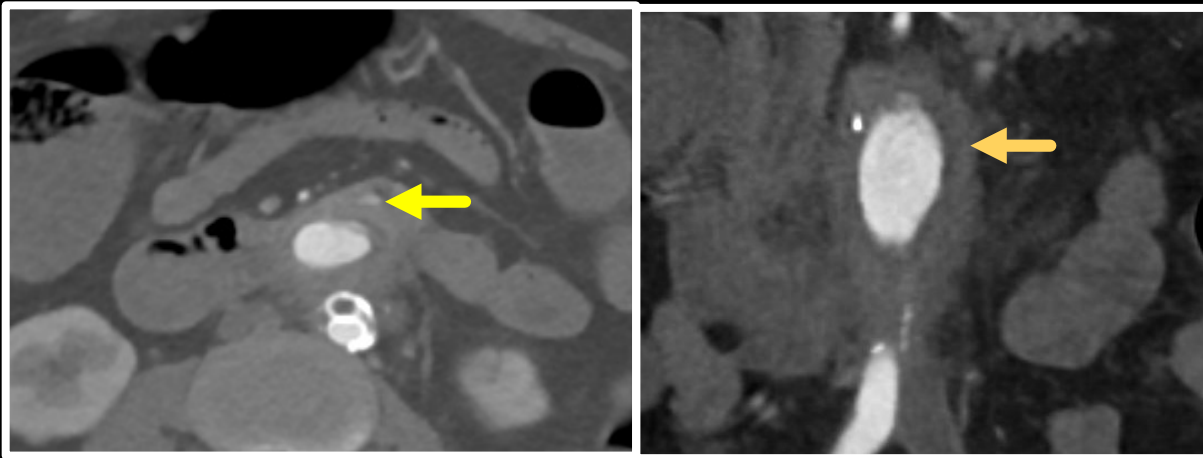


CT in a 38-year-old female demonstrates contrast blush on arterial phase (yellow arrow) which increases on portal venous phase (orange arrow). Iodinated contrast is seen on dual energy CT iodine map (green arrow)

# Vascular

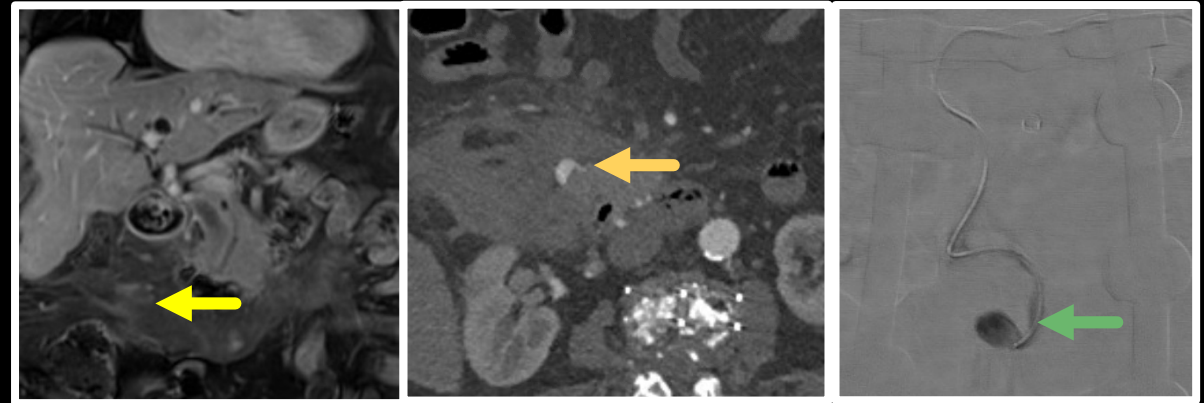
- Third part of duodenum is more prone to vascular complications like SMA syndrome and Aorto-enteric fistula (AEF) due to its close proximity to aorta.

## Aorto-Enteric Fistula



61 year old woman with left lower limb pain. CT demonstrates aorto-enteric fistula with communication between the aorta and duodenum. Small amount of contrast seen in the duodenum (yellow arrow) with extensive stranding around the aorta (orange arrow)

## Duodenal hemorrhage secondary to inferior pancreaticoduodenal artery aneurysm rupture



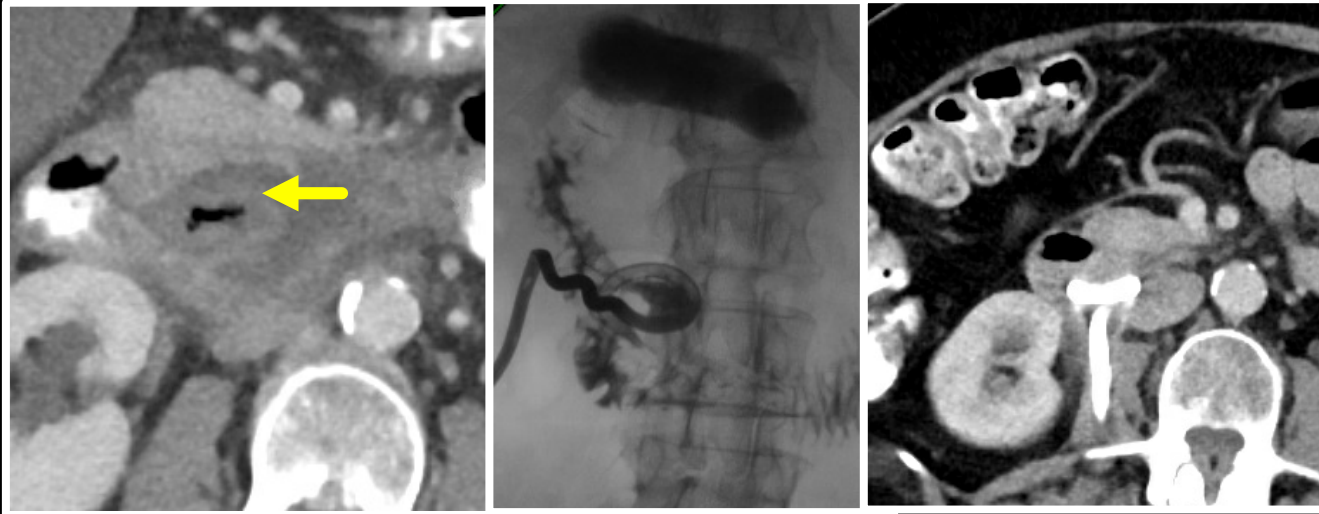
MRCP in a 65-year-old man reveals T1 hyperintense periduodenal collection (yellow arrow). Correlation with CT shows hyperdense periduodenal collection with 7mm aneurysm on CT angiogram (orange arrow). Angiogram reveals aneurysm of inferior pancreaticoduodenal artery (green arrow) which was coiled.



# Inflammatory/ Infectious

- Can be due to pancreatitis, cholecystitis (can be complicated with gallstone ileus), Crohn's or peptic ulcer disease.
- CT findings: Duodenal wall thickening with adjacent stranding, if complicated with abscess formation.

## Perforated duodenal ulcer complicated by abscess



Duodenal ulcer in a 58-year-old woman complicated by a gas containing collection (yellow arrow). Fluoroscopy with pigtail placed in the collection demonstrates a fistula and rapid filling of second part of the duodenum. IR-guided pigtail was placed to drain the abscess.

# Trauma

- Third part of duodenum is most prone to traumatic injury due to its prevertebral location.
- CT findings:  $> 4$  mm wall thickening, wall discontinuity, peri-duodenal fluid, free air, abnormal wall enhancement, intramural hematoma.

## Duodenal Rupture



Duodenal wall thickening with foci of extra-luminal air surrounding the duodenum (yellow arrows) indicating site of rupture in a 45-year-old man after falling from a height.

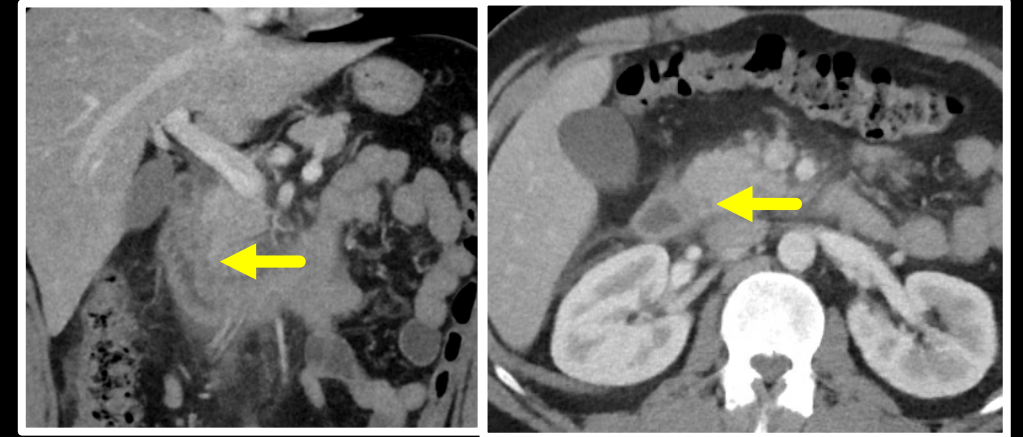
# Miscellaneous

## Bezoar



CT showing a bezoar in a 33-year-old woman. Endoscopic images show hair. Post operative image of a large bezoar.

## Post-polypectomy Syndrome



62-year-old male with duodenal diverticulum with extensive stranding along the diverticulum after polypectomy (yellow arrow)

## Conclusion

- The particular anatomic location of the duodenum, and relation with adjacent structures results in its involvement by diverse primary and secondary processes.
- Knowledge of the entities that can cause emergent duodenal pathologies and its radiologic findings are key for accurate differential diagnosis and prompt patient's management.

## References

1. Jayaraman MV, Mayo-Smith WW, Movson JS, Dupuy DE, Wallach MT. CT of the duodenum: an overlooked segment gets its due. Radiographics. 2001 Oct;21 Spec No:S147-60.
2. Heller MT, Haarer KA, Itri JN, Sun X. Duodenum: MDCT of acute conditions. Clin Radiol. 2014 Jan;69(1):e48-55.