SAR·DFP
Society of Abdominal Radiology
Disease-Focused Panels

Ileal NET with Hepatic Metastasis

Presented By:
Anastasia Singareddy; K. Desai; C. Nwachukwu; S. Kumar

SAR·DFP
Society of Abdominal Radiology
Disease-Focused Panels

Case presentation: 70 yr. old female with past medical history for Hypertension, Hyperlipedemia presents with nausea, vomiting and abdominal distension. No wbc count and normal labs.

Past Surgical History: None

Initial ED work up: CT Abdomen pelvis with contrast and MRI

CT Exam

MRI Exam

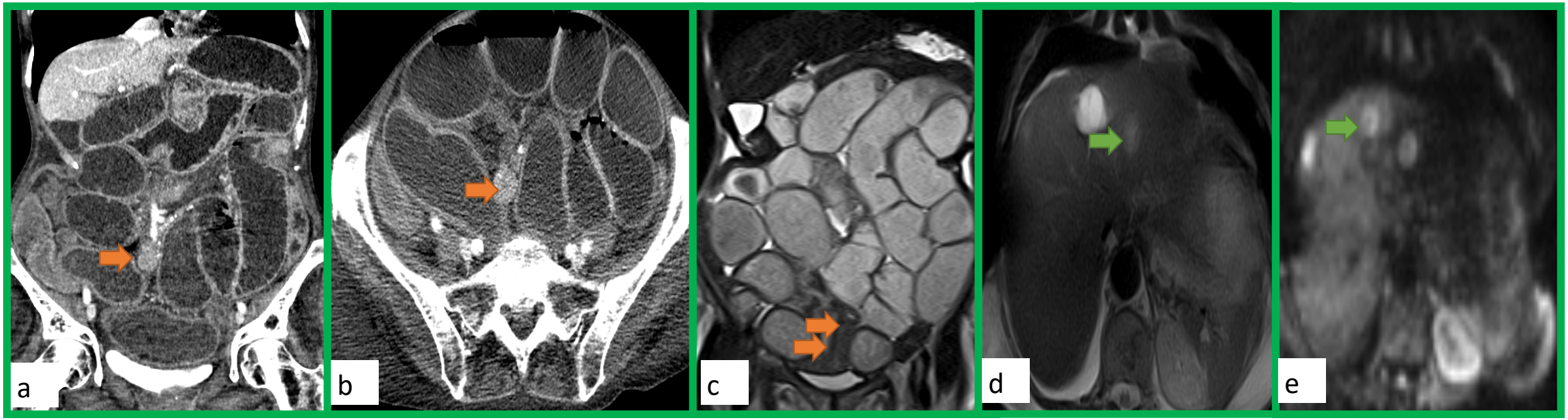
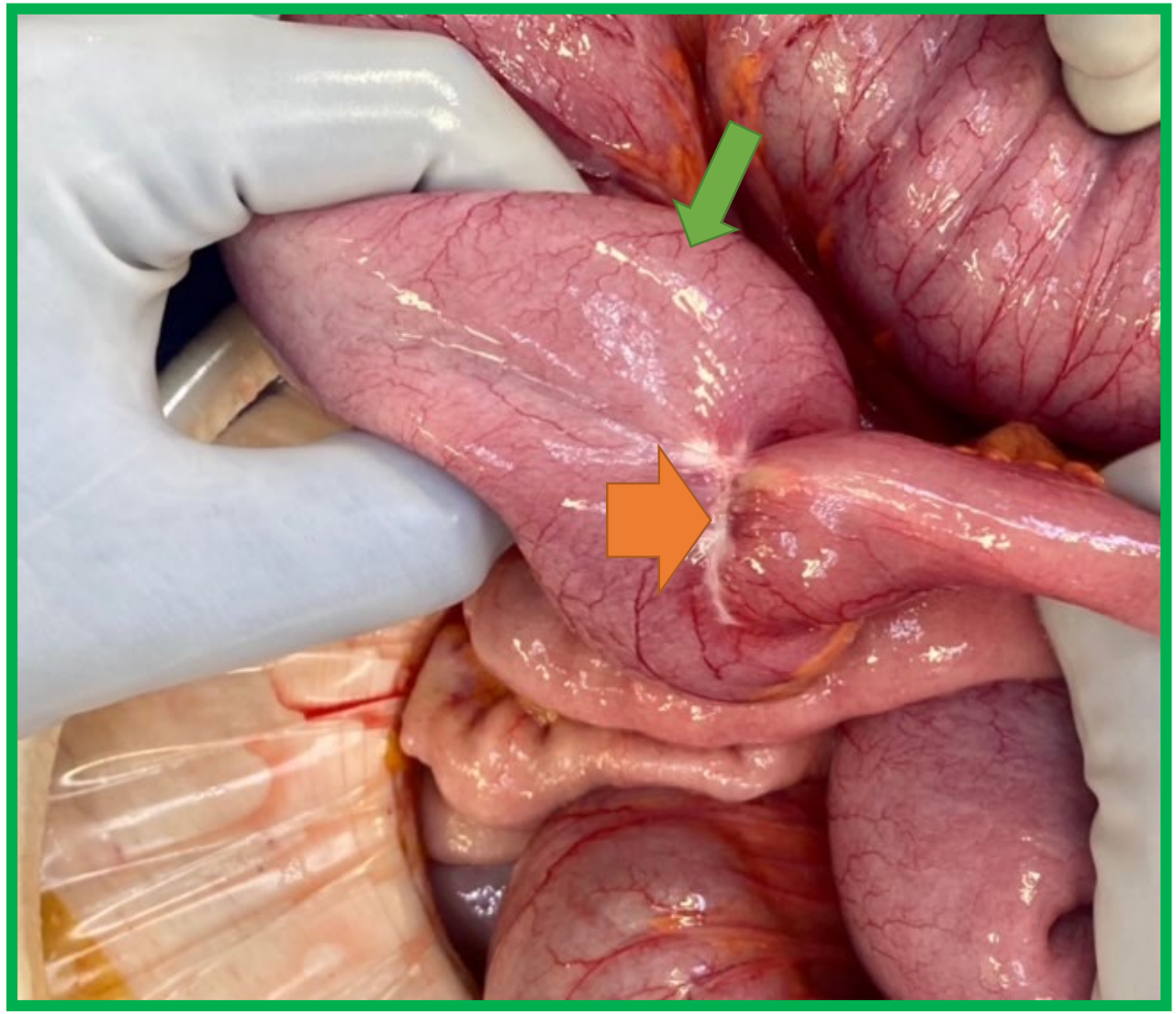


Fig1 a,b: Coronal and Axial post contrast CT demonstrate small bowel obstruction with a transition point in the right lower quadrant (collapsed distal ileum) which is thickened and enhancing (arrow) segment of the terminal ileum.

Fig 2 c,d,e: Coronal T2 weighted MRI demonstrates small bowel obstruction and stricture of the terminal ileum (orange arrows). Images d & e axial T2 weighted and DWI B 500 respectively demonstrated T2 bright metastasis in the liver (green arrows).



- Gross Surgical Pathology image demonstrates a transition point in the terminal ileum.
- Notice the focal nodular thickening and stricture of the ileum (orange arrow).
- Upstream dilation of the obstructed bowel (green arrow).

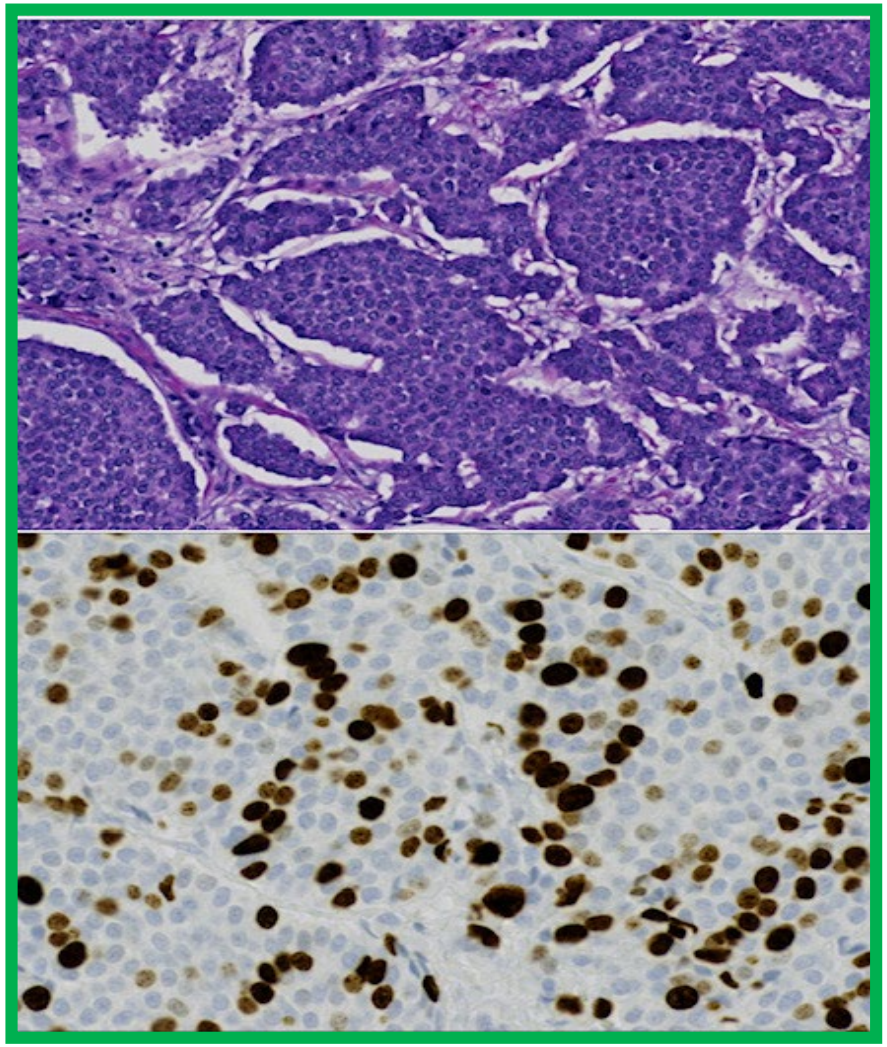


Image 1: Image 1: H&E stain, 200X

- Cells with round to oval nuclei with salt and pepper chromatin and moderate eosinophilic granular cytoplasm arranged in nests.

Image 2: Ki-67 immunostain, 400X

- 67 labeling index is approximately 25%.

These tumor cells were also positive for synaptophysin and chromogranin-A immunostains. Chromogranin-A and synaptophysin immunostain positivity suggest neuroendocrine differentiation.

Grading system based on Ki-67 labeling index
◦Low grade or grade 1 (G1): Ki67 index < 3%
◦Intermediate grade or grade 2 (G2): Ki67 index 3% - 20%
◦High grade or grade 3 (G3): Ki67 index > 20%

Gastroenteropancreatic neuroendocrine tumors (GEP-NETs)

- Distal part of the ileum is the most frequent (up to 30%) site of GEP-NETs.
- Localization of ileal carcinoids can be particularly challenging; furthermore, they are multifocal in 26%–40% of cases.

Location	Percentage of NETs	Key clinical Characteristics
Stomach (Gastric Type 1, II and III)	Type 1: 70/80 % of stomach NET Type 2: 5/6 % NET Type 3: 15-20% NET	• Type 1: Multifocal and associated with chronic gastritis. • Type 2: Multifocal and associated with ZES. • Type 3: Usually solitary.
Small Bowel Jejunum	22 % of small bowel NET's	• Early regional metastasis. Majority are well differentiated.
Ileum	70 % of Small bowel NET's	• 20 % with hepatic metastasis. • Present with bowel obstruction and Carcinoid syndrome.

Imaging Modalities & Key Teaching points

Modality	**Imaging Findings**
Multidetector CT: Unenhanced, Arterial and Venous phase. CT Enterography	• Hyper vascular nodular lesion or bowel thickening. • Desmoplastic reaction of mesentery. • Mesenteric nodal metastasis. • Enterography can demonstrate intra luminal lesions.
MR Imaging	• MR Enteroclysis has high sensitivity to detect luminal lesions. • Lesions in the wall are T2 hyper intense and show enhancement. • DWI is sensitive to detect liver metastasis.
Endoscopic US	• Mini probes to evaluate terminal ileum.

Metastasis and Key Management steps for GEP-NETs

- Likelihood of metastases beyond the mesentery is proportional to tumor size:

  Liver Disease Risk: 20-30% in tumors <1 cm,

  over 40% in tumors >2cm
- Complete surgical resection improves 5-year survival rate with an 83% favorability and is the first line.
- Partial resection or liver transplantation is suggested to select patients as an alternative (especially in non multifocal disease).
- Local-regional cytoreductive therapies such as radiofrequency ablation embolization techniques for liver dominant symptomatic disease.
- SSTRs for well differentiated and low proliferation index tumors or metastasis.
- Systemic Chemotherapy for aggressive biology produces a response rate of 42-67%.

References:

- Chang S, Choi D, Lee SJ et al.. Neuroendocrine neoplasms of the gastrointestinal tract: classification, pathologic basis, and imaging features. **RadioGraphics** 2007;27(6):1667–1679.
- Modlin IM, Oberg K, Chung DC et al.. Gastroenteropancreatic neuroendocrine tumours. Lancet Oncol 2008;9(1):61–72.
- Bancks NH, Goldstein HM, Dodd GD Jr. The roentgenologic spectrum of small intestinal carcinoid tumors. *Am J Roentgenol Radium Ther Nucl Med* 1975; 123:274–280
- Baxi AJ, Chintapalli K, Katkar A, Restrepo CS, Betancourt SL, Sunnapwar A. Multimodality imaging findings in carcinoid tumors: a head-to-toe spectrum. *RadioGraphics* 2017; 37:516–536
- Dromain C, de Baere T, Lumbroso J, et al. Detection of liver metastases from endocrine tumors: a prospective comparison of somatostatin receptor scintigraphy, computed tomography, and magnetic resonance imaging. *J Clin Oncol* 2005; 23:70–78
- Ganeshan D, Bhosale P, Yang T, Kundra V. Imaging features of carcinoid tumors of the gastrointestinal tract. *AJR* 2013; 201:773–786
- Hakim FA, Alexander JA, Huprich JE, Grover M, Enders FT. CT-enterography may identify small bowel tumors not detected by capsule endoscopy: eight years experience at Mayo Clinic Rochester. *Dig Dis Sci* 2011; 56:2914–2919
- Hicks RJ. Use of molecular targeted agents for the diagnosis, staging and therapy of neuroendocrine malignancy. *Cancer Imaging* 2010; 10:S83–S91
- Horton KM, Kamel I, Hofmann L, Fishman EK. Carcinoid tumors of the small bowel: a multitechnique imaging approach. *AJR* 2
- Woltering EA, Voros BA, Beyer DT, et al. Aggressive surgical approach to the management of neuroendocrine tumors: a report of 1,000 surgical cytoreductions by a single institution. *J Am Coll Surg* 2017; 224:434–447