

Radiology Team 429

Gastrointestinal
Radiology
Upper GI + Lower GI



Radiology Team 429

In this team we used the outlines from
the:
Doctor's slides
Lecture notes
427 Radiology team
Diagnostic Imaging –PETER ARMSTRONG
– 6th Edition

Sorry we don't hold responsibility for any
missing information or perhaps –
perhaps -wrong material.

We tried our best to present this lecture
in the best way, and we hope what
we wrote is enough to cover the
subjects.

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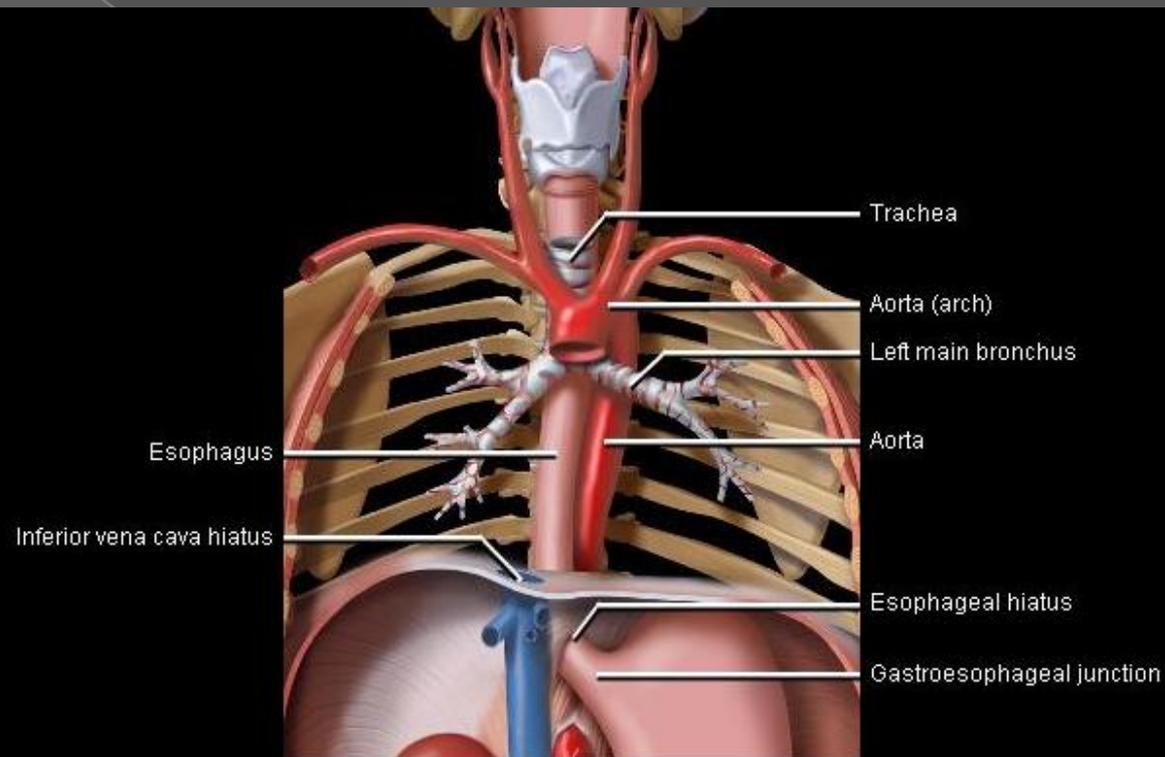
Best Wishes :)

- ◉ Same as the past lec .. The note will be AFTER the pic :)
- ◉ If the slide contain star that means this is Dr's notes :)

THE ESOPHAGUS

THE ESOPHAGUS

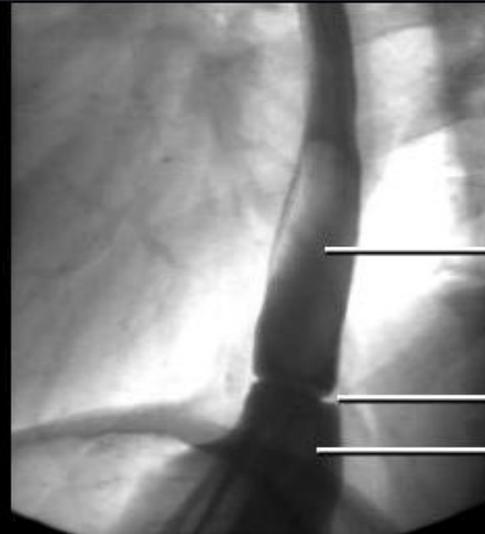
Normal Anatomy



The esophagus enters the thorax at about T1 level behind and slightly to the left of the trachea. It is usually indented on its left antero-lateral surface by the arch of the aorta and the left main bronchus. The esophagus is closely applied to the aorta throughout its course, and may be pushed or pulled by aortic abnormalities, such as aneurysm or ectasia. The esophagus enters the abdomen at about the T10 level, between fibers of the right crus of diaphragm. The esophageal hiatus lies more caudal than the hiatus for the inferior vena cava, and cephalad to the inferior vena cava hiatus.

- Esophagus is an organ that starts at the level of T1 and ends at T10
- Behind the aorta
- And it is closely related to trachea on the anterolateral surface , the arch of the aorta affect the trachea.
- So an aortic aneurism may affect the esophagus function
- * Important slide *

Lateral view (barium swallow)



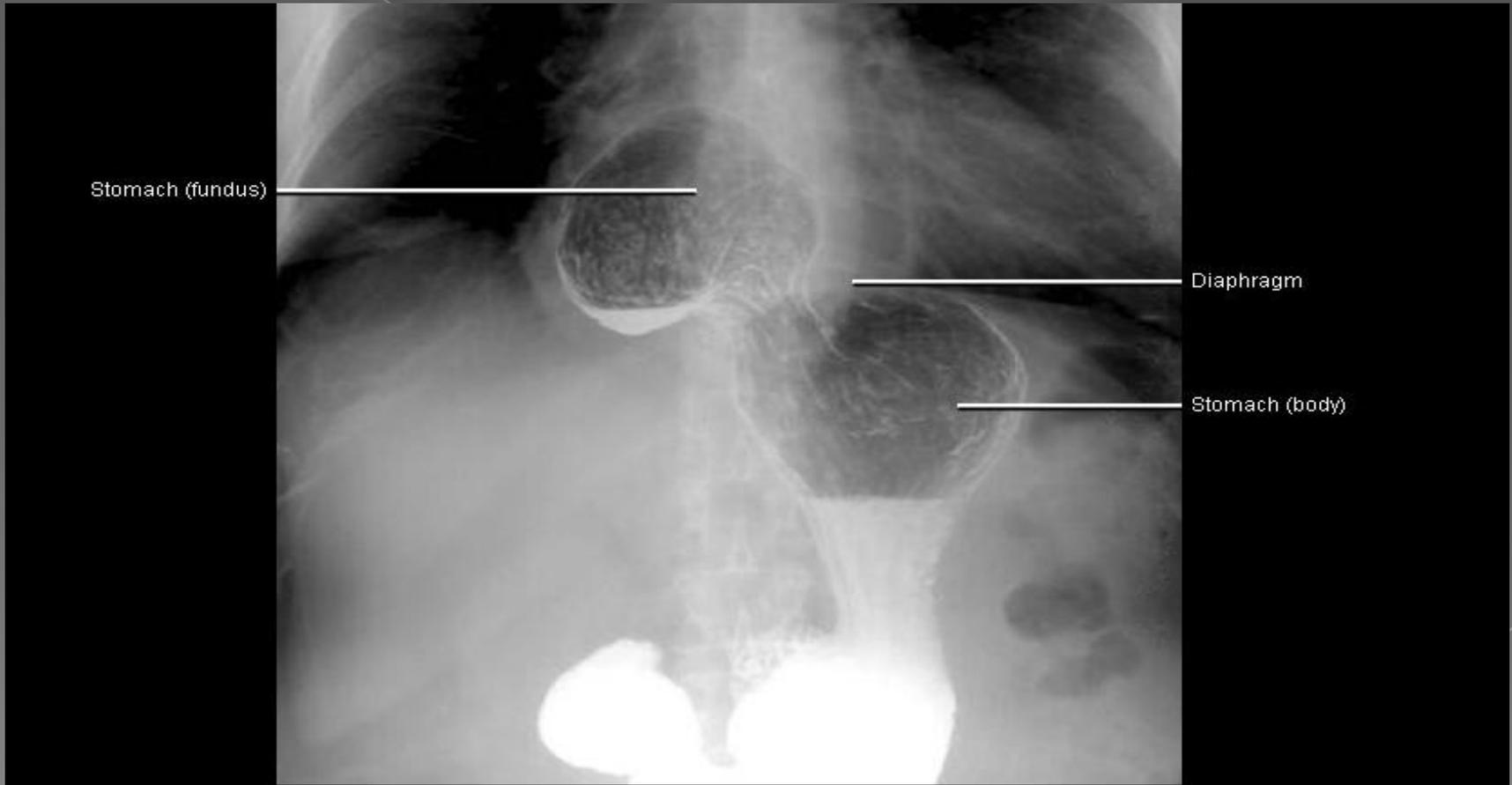
Esophagus

B ring

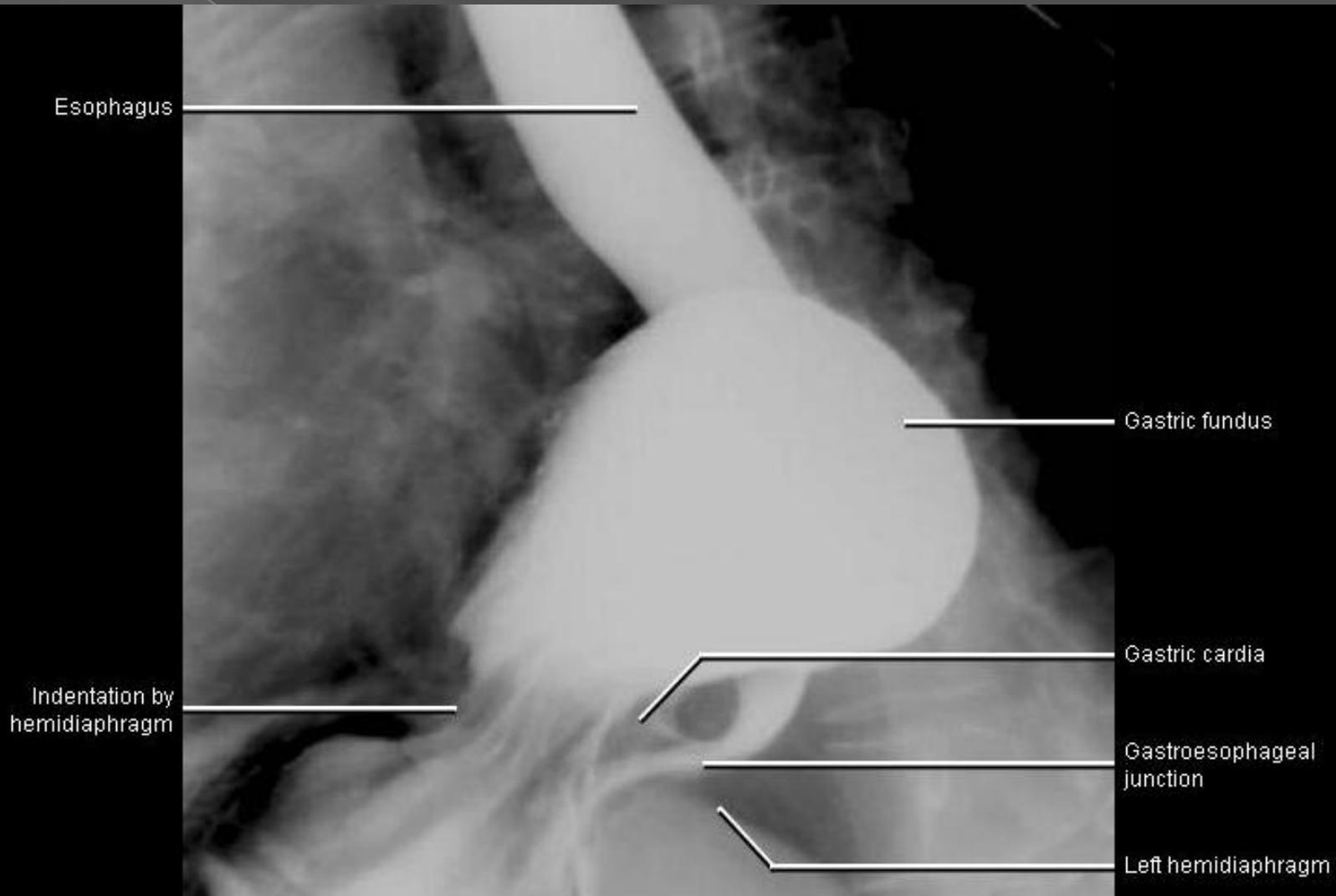
Herniated gastric cardia

First of two films from a barium esophagram shows a web-like narrowing at the gastroesophageal junction, a typical feature of the esophageal B ring, which marks the junction. The B ring is well seen due to the hiatal hernia and good fluoroscopic technique which has distended the distal esophagus and proximal stomach.

1.Hernia

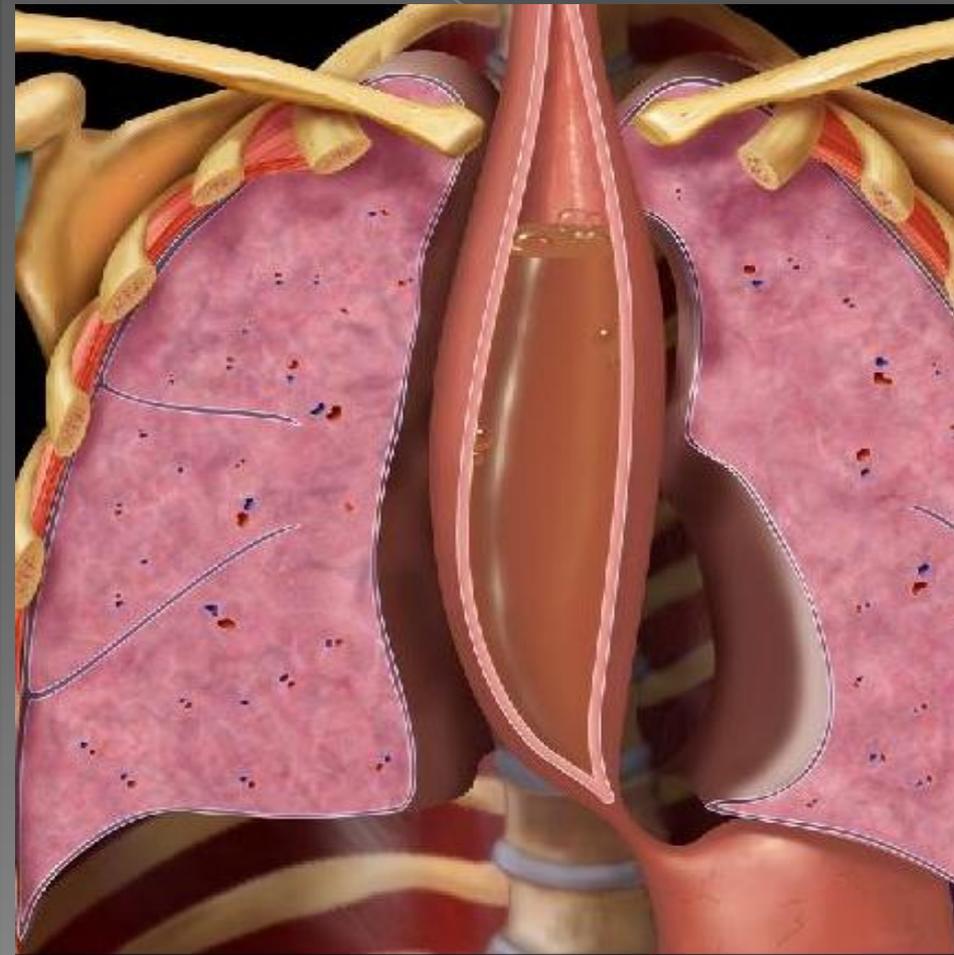


Hernia



- Hiatus hernia
- 1st pic is a double contrast (gas + barium)
→ shows the mucosa if there was any ulceration (the contrast will collect there)
- 2nd pic is a single contrast (only barium) → only shows the normal configuration of the anatomy

2. ACHALASIA



- ⦿ **Dilation of the esophagus with a narrowing at the distal end (achalasia) caused by a neuromuscular problem**
- ⦿ **Esophagus is dilated > 4cm**



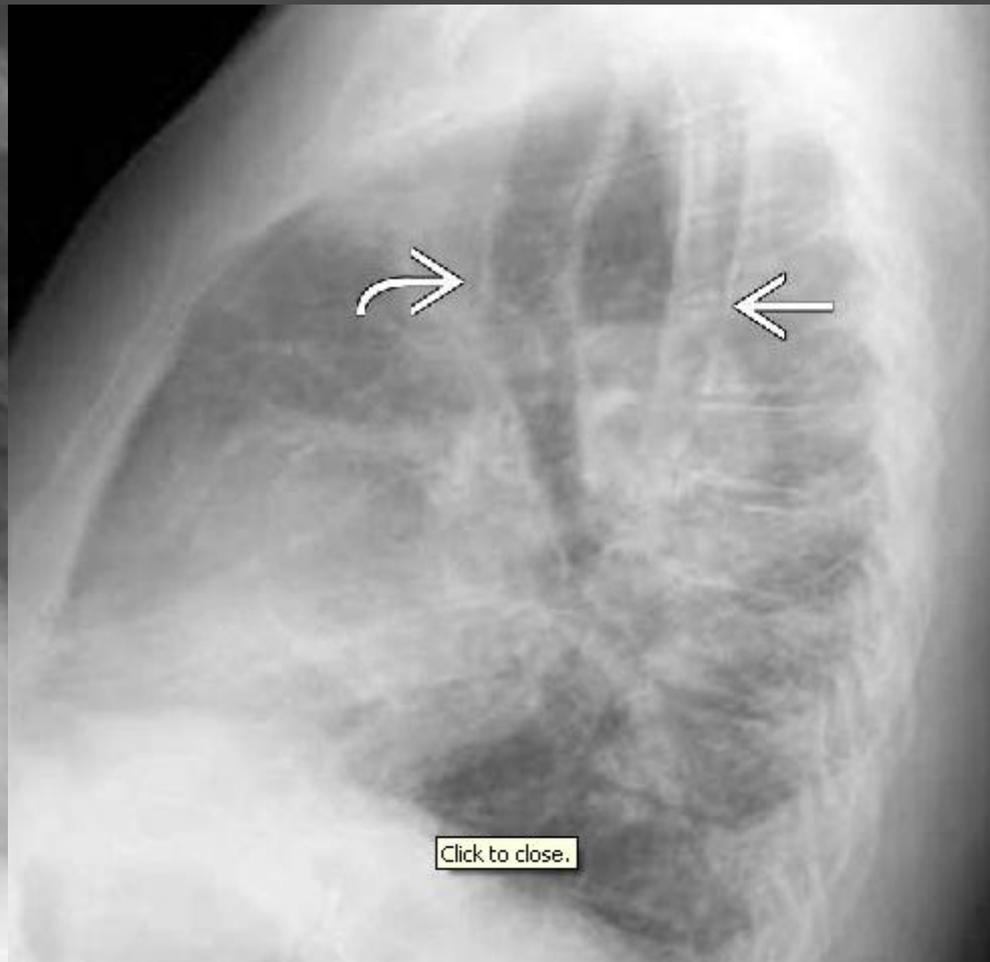
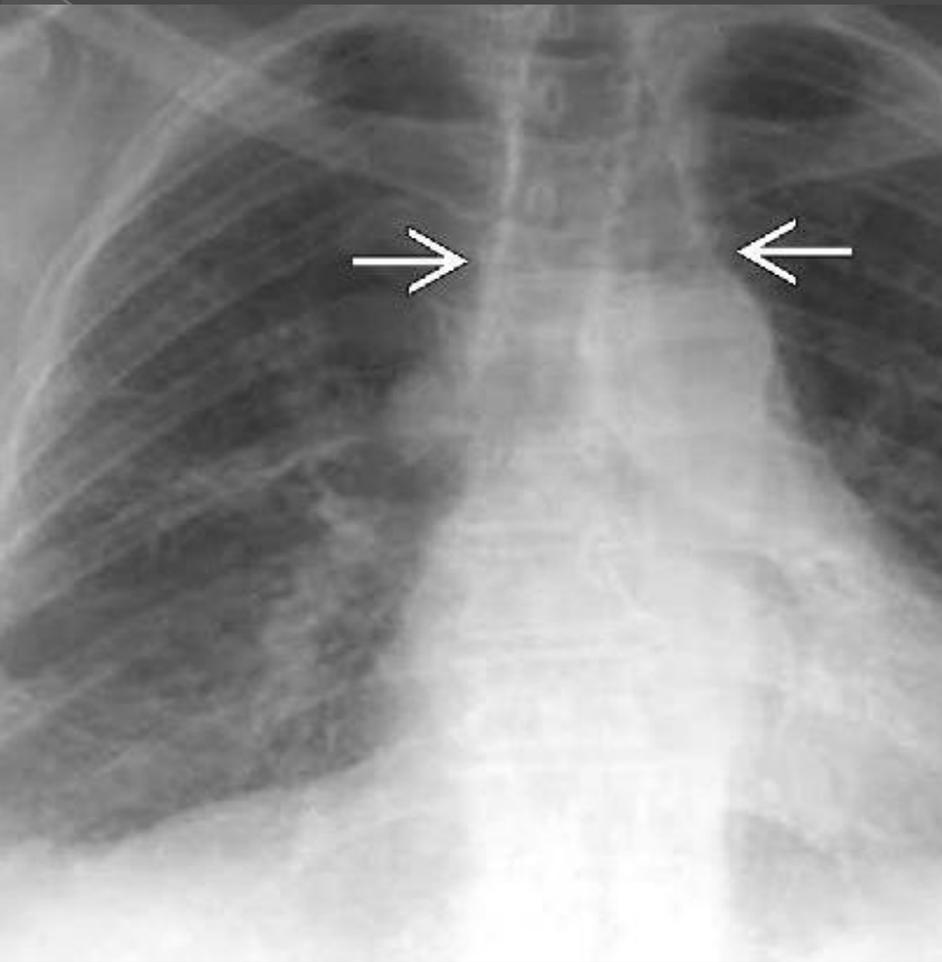
- **Terminology: Synonyms** **Cardiospasm** **Definitions: Primary motility disorder, esophageal smooth muscle**
- **Imaging:**
- **Classified based on etiology: Primary or secondary**
- **Primary (idiopathic)"Bird-beak" deformity: Dilated esophagus with smooth, symmetric, tapered narrowing at esophagogastric region. Temporary transit via cardia when hydrostatic pressure of barium column is above tonic LES pressure**
Length of narrowed segment < 3.5 cm; widest diameter upstream is > 4 cm
- **Secondary (pseudoachalasia)****Intrinsic or extrinsic tumor, peptic stricture, post-vagotomy, Chagas disease. Manometric characteristics of achalasia**
Increased or normal resting lower esophageal sphincter pressures. Incomplete or absent LES relaxation on swallowing
- **Top Differential Diagnoses: Esophageal scleroderma, Esophageal carcinoma, Esophagitis with stricture**
- **Pathology Complications: Aspiration pneumonitis, Superimposed infection (e.g., *Candida esophagitis*)**
- ***Risk of carcinoma increased by 10x***
- ***Clinical Issues Treatment: Heller myotomy (partial thickness incision of LES)***
Partial (Toupet) fundoplication often incorporated into myotomy procedure



- **IMAGING: General Features**
- **Best diagnostic clue: "Bird-beak" deformity: Dilated esophagus with smooth, symmetric, tapered narrowing at esophagogastric region**
- **Morphology: Grossly dilated esophagus with smooth tapering at lower end of esophagus**
Other general features
Classified based on etiology
Primary (idiopathic)
Secondary (pseudoachalasia)
Manometric characteristics of achalasia:
Absence of primary peristalsis
Increased or normal resting lower esophageal sphincter (LES) pressures
Incomplete or absent LES relaxation on swallowing
Variants of achalasia: Atypical manometric findings
Early:
Characterized by aperistalsis with normal LES pressure
Vigorous:
Simultaneous high amplitude and repetitive contractions
Both variants are transitional and finally evolve into classic achalasia
- **Classic achalasia (primary): Simultaneous low amplitude contractions. Motor function of pharynx and upper esophageal sphincter are normal**
- **Radiographic Findings: Radiography**
Chest x-ray AP & lateral views
- **Advanced achalasia**
Classic mediastinal widening, double contour of mediastinal borders. Outer borders represent dilated esophagus projecting beyond shadows of aorta and heart. Anterior tracheal bowing. Air-fluid level in mediastinum, small or absent gastric air bubble
- **Lower lobes: Decreased lung volume, linear opacities, and tubular radiolucencies**



- **Video fluoroscopic barium study findings:**
- **Primary achalasia: Markedly dilated esophagus, Absent primary peristalsis, "Bird-beak" deformity: V-shaped, conical, and smooth; symmetric tapered narrowing of distal esophagus extending to gastroesophageal (GE) junction, Temporary transit via cardia when hydrostatic pressure of barium column is above tonic LES pressure. Length of narrowed segment < 3.5 cm; widest diameter upstream > 4 cm**
- **Secondary achalasia (pseudoachalasia) Mildly dilated esophagus (< 4 cm at its widest point) Decreased or absent peristalsis. Eccentricity, nodularity, shouldering of narrowed distal segment. Length of distal narrowed esophageal segment: Usually > 3.5 cm**
- **CT Findings: Moderate to marked dilatation of esophagus with diameter > 4 cm. Decreased or normal wall thickness, Air-fluid level within dilated esophagus, abrupt, smooth narrowing of distal esophageal segment near gastroesophageal (GE) junction. Squamous cell carcinoma of esophagus in longstanding achalasia, Irregular wall thickening, Eccentric narrowing of distal esophagus extending into GE junction. Involvement of periesophageal soft tissues & blood vessels, enlarged mediastinal lymph nodes**



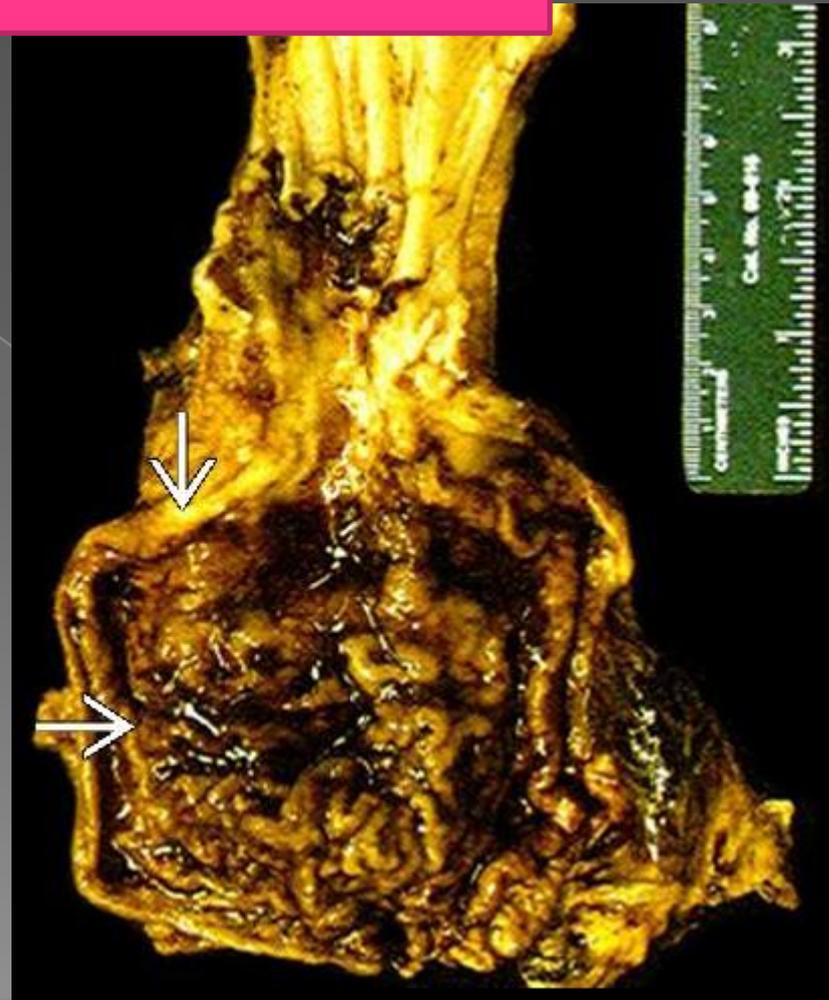
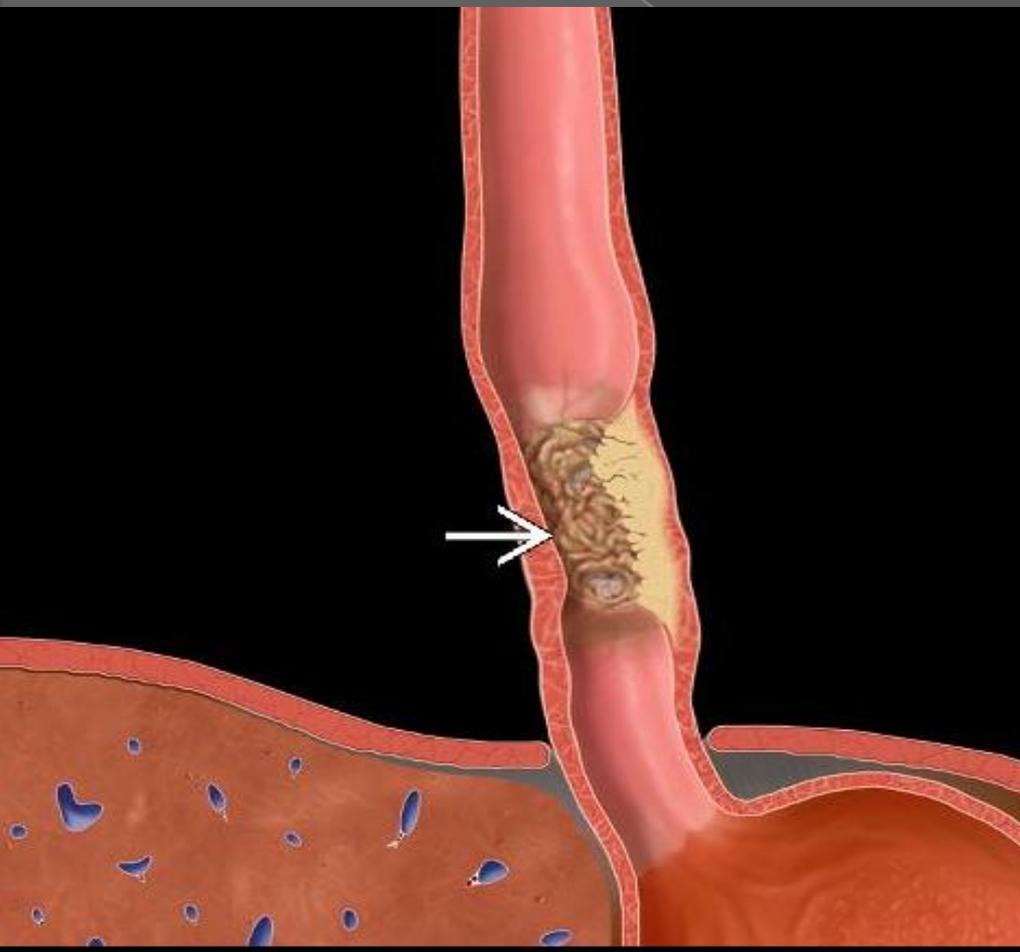
Barium swallow with an obvious rat tail appearance

Barium swallow with an obvious rat tail appearance



3.ESPHAGEAL CANCER

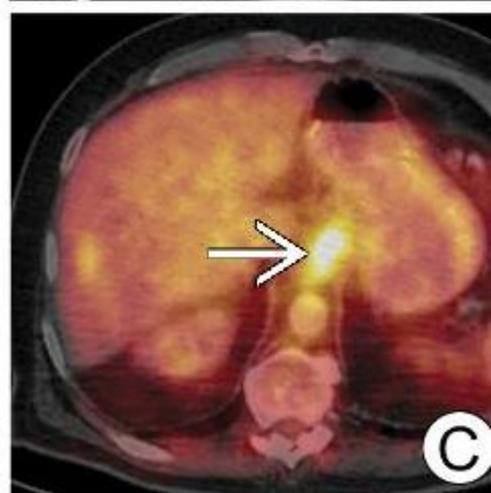
Problem in the muscoa (cancer) which lead to narrowing of the esophagus





- **Imaging Findings**
 - Absence of a fat plane between the airway and the esophageal mass cannot be used as an indication of invasion
 - FDG PET: Hypermetabolic esophageal mass, lymphadenopathy, distant metastases
 - Endoscopic ultrasound (EUS) for most accurate T and N staging
 - PET indicated for initial staging and to identify surgical candidates
 - PET/CT used to Determine precise location of pathological uptake near primary tumor
 - Identify distant metastases
 - Avoid unnecessary surgery in up to 38% of patients who were initially considered eligible for curative resection with conventional methods
 - PE/CT highly sensitive and accurate for detection of recurrent esophageal squamous cell carcinoma (93-96%)
 - Top Differential Diagnoses
 - Inflammatory Esophagitis
 - Intramural Primary Esophageal Tumor
 - Other Thoracic Malignancy
 - Normal Variants (FDG PET)
 - Diagnostic Checklist
 - Overlap of imaging findings with inflammatory causes of hypermetabolic esophageal lesions





Coronal PET (A), axial CT (B) and fused PET/CT (C) demonstrate focal intense activity (white arrow) near the gastroesophageal junction, compatible with primary esophageal carcinoma. A focal area of intense activity (black curved) is also present within the liver, compatible with a liver metastasis.

- ◉ **Picture (C) :**
- ◉ **Is a PET/CT : (combination of positron emission tomography + Computed tomography)**
- ◉ **The dr says: flurodeoxyglucose + CT**



- **Imaging**
- Squamous cell carcinoma)SCC (
 - > 2 major risk factors in USA :Tobacco and alcohol abuse
- Adenocarcinoma
 - > 10-15% of cases arise from Barrett mucosa
 - > Increasing in prevalence relative to SCC
- Double-contrast esophagography
 - > Best for detection of early cancer
 - > Usually a sessile polyp or flattening of esophageal wall
- Advanced cancer
 - > Luminal constriction)stricture (with nodular or ulcerated mucosa
 - > Polypoid, ulcerative, varicoid, irregular constricting forms
- CT :Useful for staging
 - > Mediastinal and abdominal lymphadenopathy
 - > Liver and other metastases
- Endoscopic ultrasonography)EUS (
 - > Useful for determining depth of wall invasion
- PET CT :Superior to CT in detecting regional and distant metastases
- **Top Differential Diagnoses**
- Reflux esophagitis)with stricture, Esophageal intramural benign tumors, Esophageal metastases and lymphoma, Radiation esophagitis, Foreign body, esophagus
-



- **Clinical Issues**

- Early cancer :5-year survival =90%
- Surgery, radiation)pre -and postoperative radiation (
- Esophagectomy with gastric interposition; most common

- **TERMINOLOGY Definitions**

- Squamous cell carcinoma :Malignant transformation of squamous epithelium
- Adenocarcinoma :Malignant dysplasia in columnar metaplasia)Barrett mucosa(

- **IMAGING General Features**

- Best diagnostic clue :Fixed irregular narrowing of esophageal lumen with destroyed mucosal pattern
- Location :Middle 1/3)50%(, lower 1/3)3Morphology

- > Classification of advanced esophageal cancer based on gross pathology and radiographic findings
 - Infiltrating, polypoid, ulcerative, varicoid lesions

- Other general features

- > Carcinoma is most common tumor of esophagus
- > Squamous cell carcinoma)SCC (
 - Accounts for 50-70% of all esophageal cancers
 - %\ of all cancers and 7% of all gastrointestinal cancers
 - ȳmajor risk factors in USA :Tobacco and alcohol abuse
 - Human papillomavirus :Synergistic increased risk factor
- > Adenocarcinoma
 - Accounts for 30-50% of all esophageal cancers
 - %\ ••-9• of cases arise from Barrett mucosa
 - Increasing in prevalence relative to SCC

- 0%(, upper 1/3)20% (



- **Radiographic Findings**

- Radiography

- > Chest radiograph)PA and lateral view :(Advanced carcinoma

- Hilar, retrohilar, or retrocardiac mass
 - Anterior bowing of posterior tracheal wall
 - Retrotracheal stripe thickening > 3 mm

- Double-contrast esophagography :En face and profile views

- > Early esophageal squamous cell cancer

- Plaque-like lesions :Small, sessile polyps, or depressed lesions

- > Early adenocarcinoma in Barrett esophagus

- Plaque-like lesions :Flat, sessile polyps
 - Localized area of flattening/stiffening in wall of peptic stricture)common in distal 1/3(

- > Advanced esophageal squamous cell cancer

- Infiltrating lesion)most common :(Irregular narrowing, luminal constriction)stricture (with nodular or ulcerated mucosa
 - Polypoid lesion :Lobulated, fungating intraluminal mass
 - Ulcerative lesion :Well-defined meniscoid ulcers with radiolucent rim of tumor surrounding ulcer in profile view
 - Varicoid lesion :Thickened, tortuous, serpiginous longitudinal folds due to submucosal spread of tumor, mimicking varices

- > Advanced adenocarcinoma in Barrett esophagus

- Radiologically indistinguishable from squamous
 - Long infiltrating lesion in distal esophagus

- > Stricture in advanced carcinoma

- Asymmetric contour with abrupt proximal borders of narrowed distal segment ")rat-tail " appearance(





- **CT Findings**

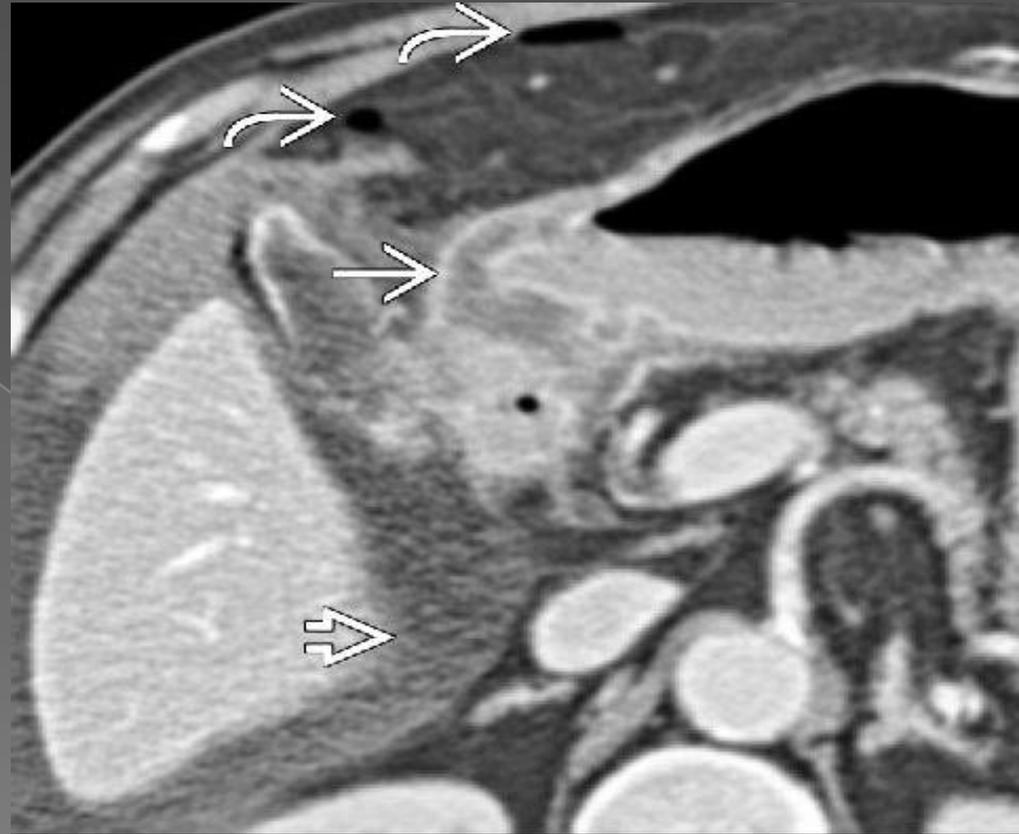
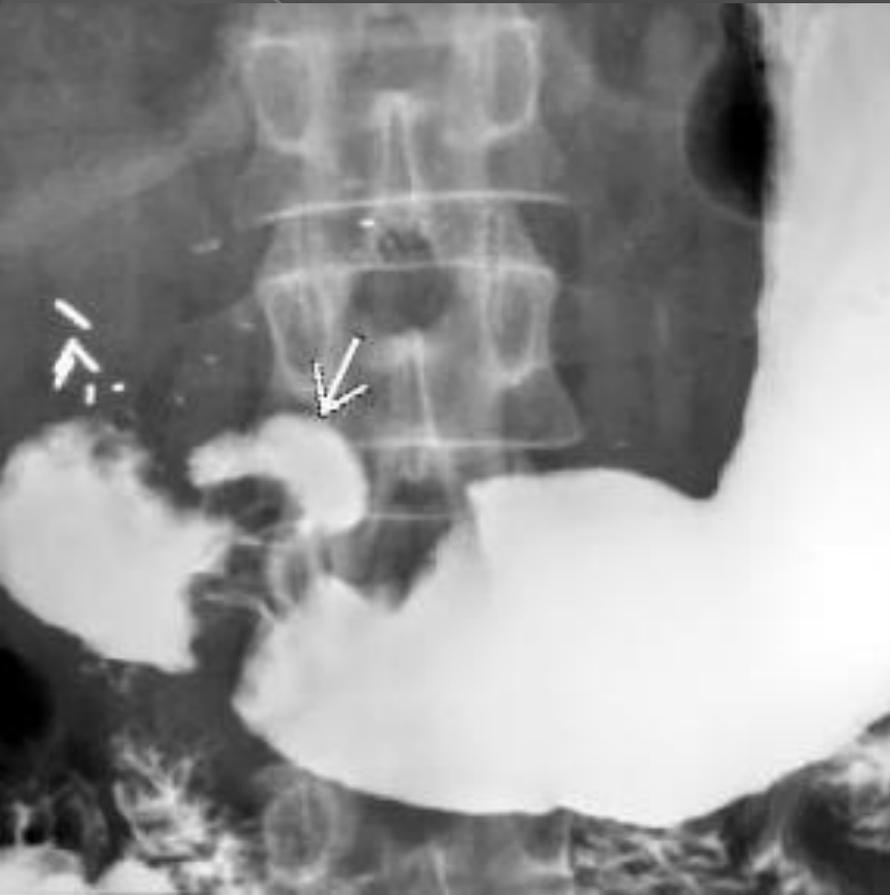
- CT :Staging of esophageal carcinoma

- > Stage I and II :Localized wall thickening or small luminal tumor, without mediastinal invasion
- > Stage III :Tumor extends beyond esophagus into mediastinal tissues
 - Tracheobronchial invasion :Posterior wall indentation/bowing and tracheobronchial displacement/compression; ± collapse of lobes
 - Aortic invasion :Uncommon finding)2% of cases (
 - Pericardial invasion :Based on obliteration of fat plane or mass effect
 - Mediastinal adenopathy :Discrete or confluent with primary tumor
- > Stage IV :Extends into mediastinum and distant sites
 - Liver, lungs, pleura, adrenals, kidneys, and nodes
 - Subdiaphragmatic adenopathy seen in > 2/3 of distal cancers

4) GASTRIC ULCER

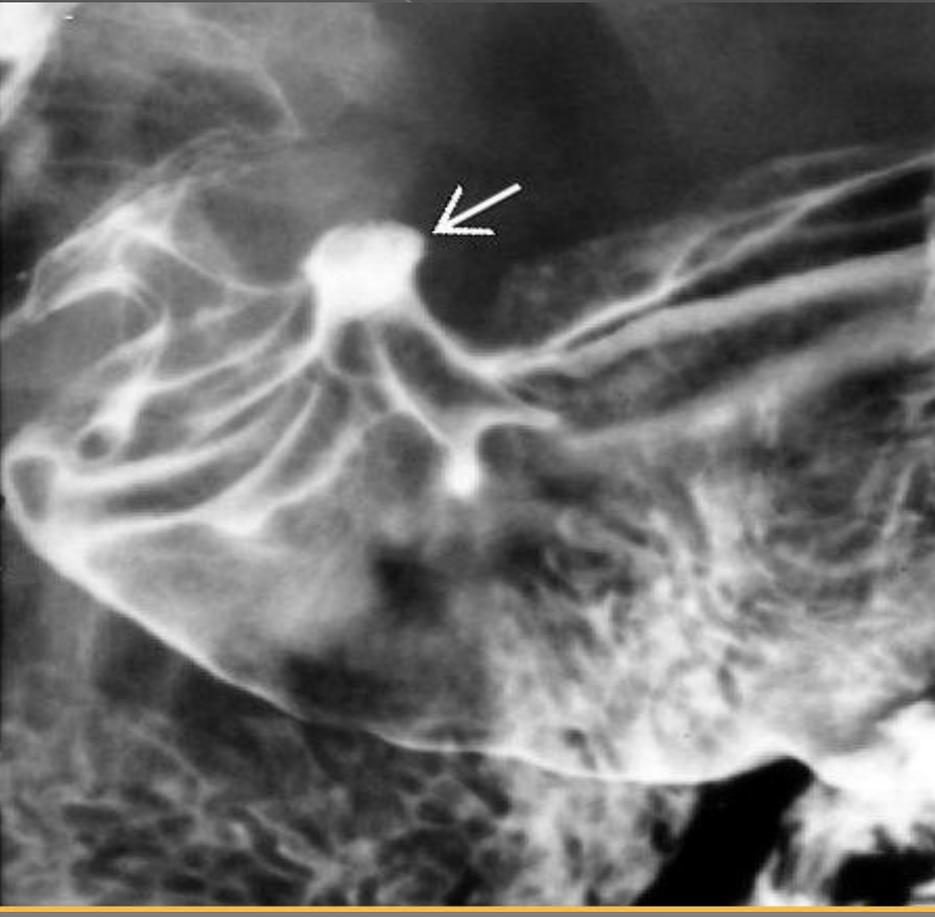
Denudation
of mucosa
which will
cause ulcer

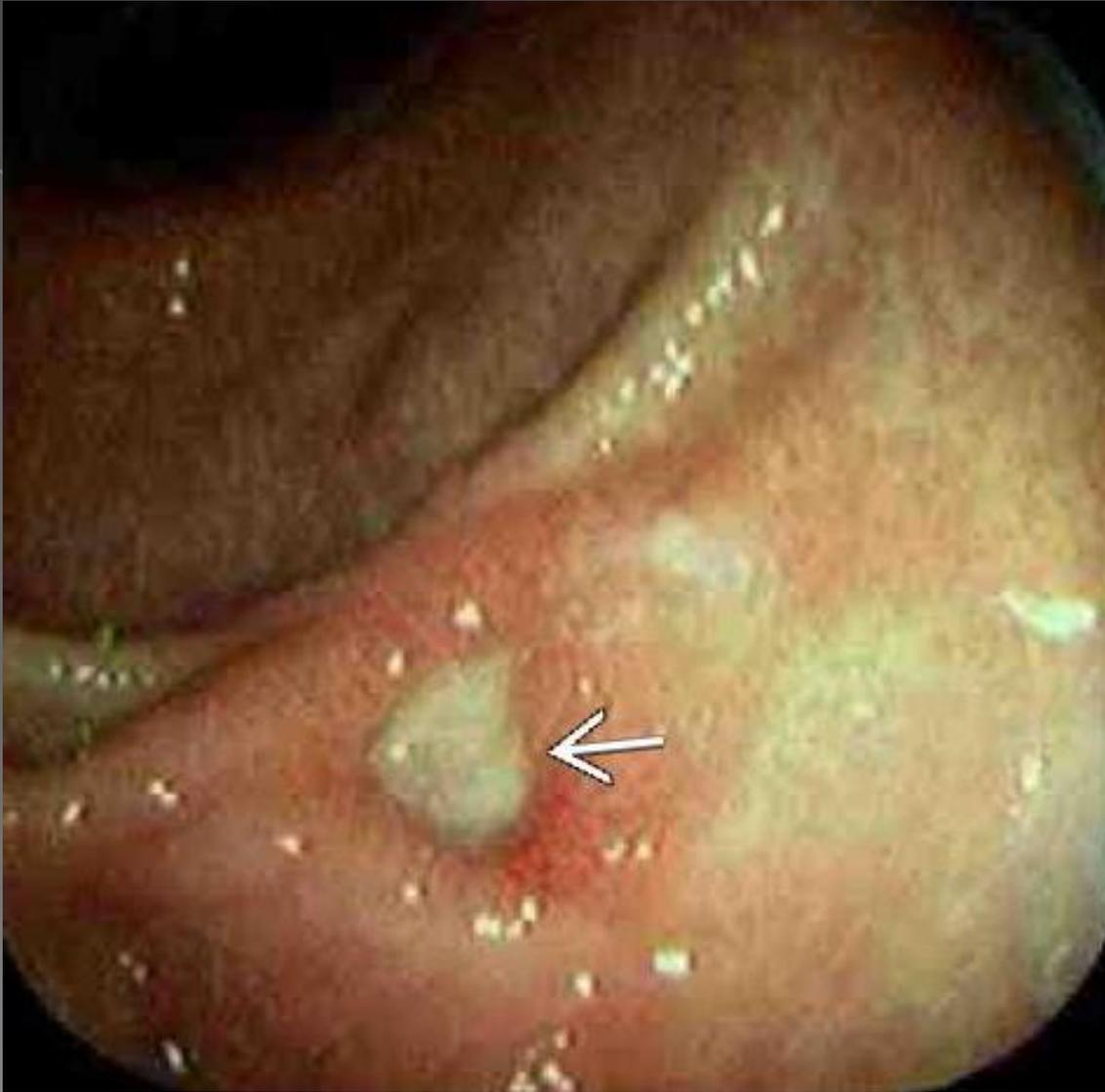




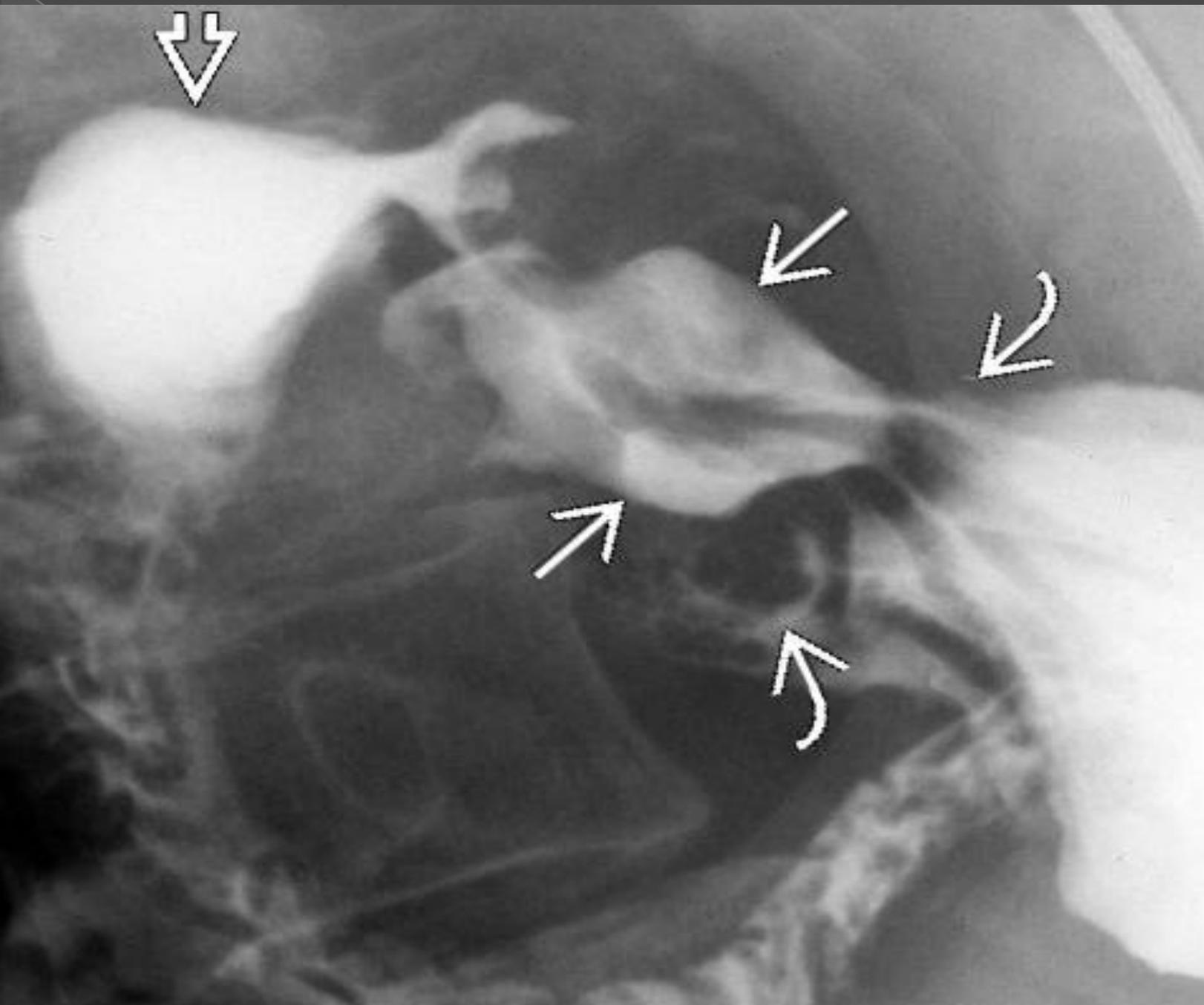
Left pic : Free air (pneumo peritonium) which is caused mostly by a perforated duodenal ulcer .. It maybe caused by a gastric ulcer but duodenal is more common (MCQ)

Double contrast because as seen the mucosal folds are collecting the contrast and also it is concentrated at the ulcer





endoscopy



Double contrast duodenal ulcer

Free air → pneumoperotenum



Complications of peptic ulcer: perforation which could lead to pneumoperitoneum (air in the peritoneum)

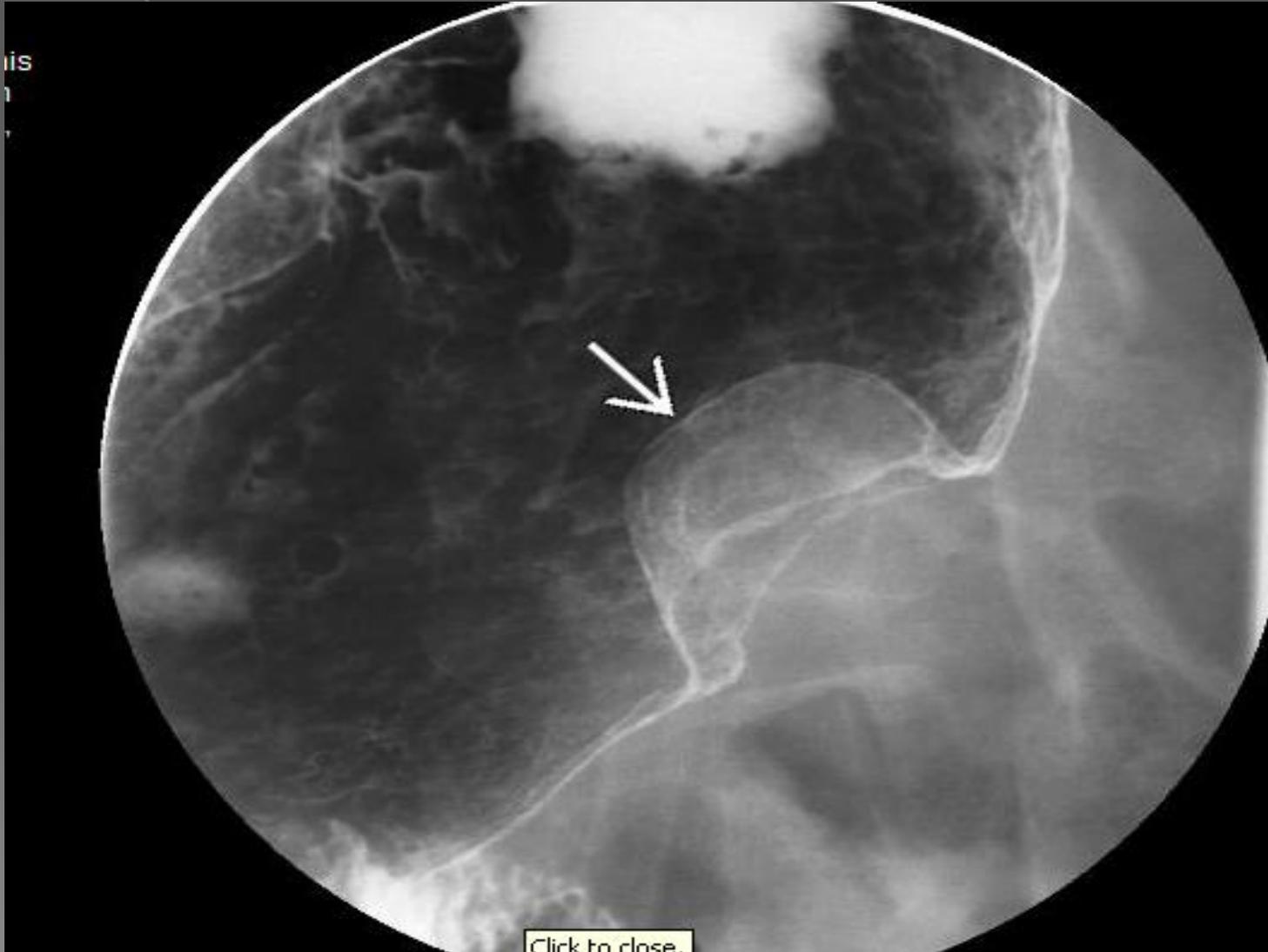


A patient complains of vomiting and have a dilated loops of bowel

Small bowel obstruction (what is the most common cause ?)
A/ adhesions
MCQ !!

5) GI TUMORS

Single
contrast





- **Terminology**
- Most common mesenchymal tumors of gastrointestinal (GI) tract .All GISTs potentially malignant
- **Imaging Findings**
- Stomach primary: 60-70%
- Small intestine primary: 20-25%
- Colon/rectal primary: 5%
- Esophageal primary: < 5%
- Common metastatic sites: Liver and peritoneum
- Uncommon metastatic sites: Lymphadenopathy, pulmonary and pleural metastases
- **Top Differential Diagnoses**
- Leiomyosarcoma, Other Gastric Wall Tumors
- Lymphoma
- Metastases
- **Clinical Issues**
- Prognosis for localized tumors based on size and mitotic rate
- Metastatic GIST: Median survival 19 months
- Local GIST recurrence: Median survival 9-12 months
- **Diagnostic Checklist**
- Bulky abdominal soft tissue mass without lymphadenopathy = common GIST presentation
- Mass usually exophytic (sometimes pedunculated), outside organ of origin
- Central necrosis/hemorrhage common
- Look for small nodular areas of viable tumor in areas of necrosis on F-18 FDG PET



- **TERMINOLOGY Abbreviations and Synonyms**

- Gastrointestinal stromal tumor (GIST)

- **Definitions**

- Most common mesenchymal tumors of gastrointestinal (GI) tract

- All GISTs potentially malignant

- > If < 2 cm usually considered benign

- > Even small lesions should be resected

- **IMAGING FINDINGS General Features**

- Best diagnostic clue

- > Large mass outside organ of origin

- > Usually markedly FDG avid

- Location

- > Primary tumor

- Stomach primary: 60-70%

- Small intestine primary: 20-25%

- Colon/rectal primary: 5%

- Esophageal primary: < 5%

- > Metastases

- Common metastatic sites: Liver and peritoneum

- Uncommon metastatic sites: Lymphadenopathy, pulmonary and pleural metastases

- Size

- > Varies, but often large on presentation

- Can be massive (> 30 cm)

- Morphology

- > Exophytic and outside organ of origin

- Usually arising from organ periphery

- Sometimes pedunculated

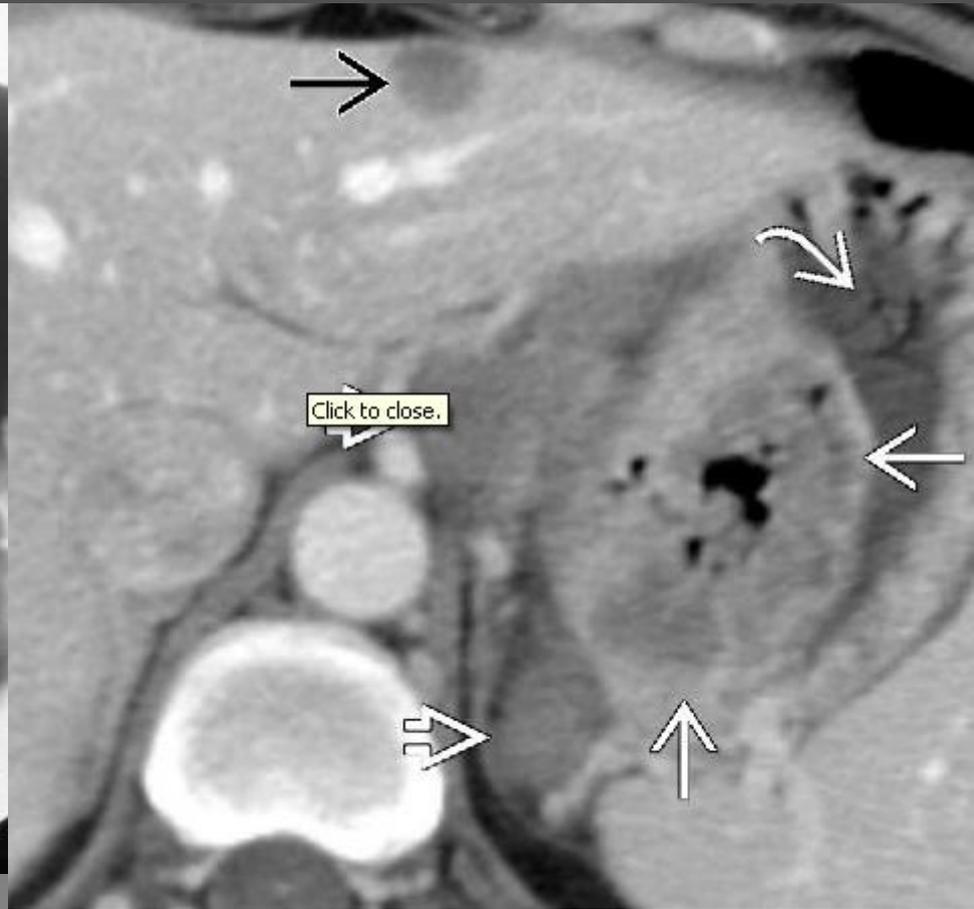
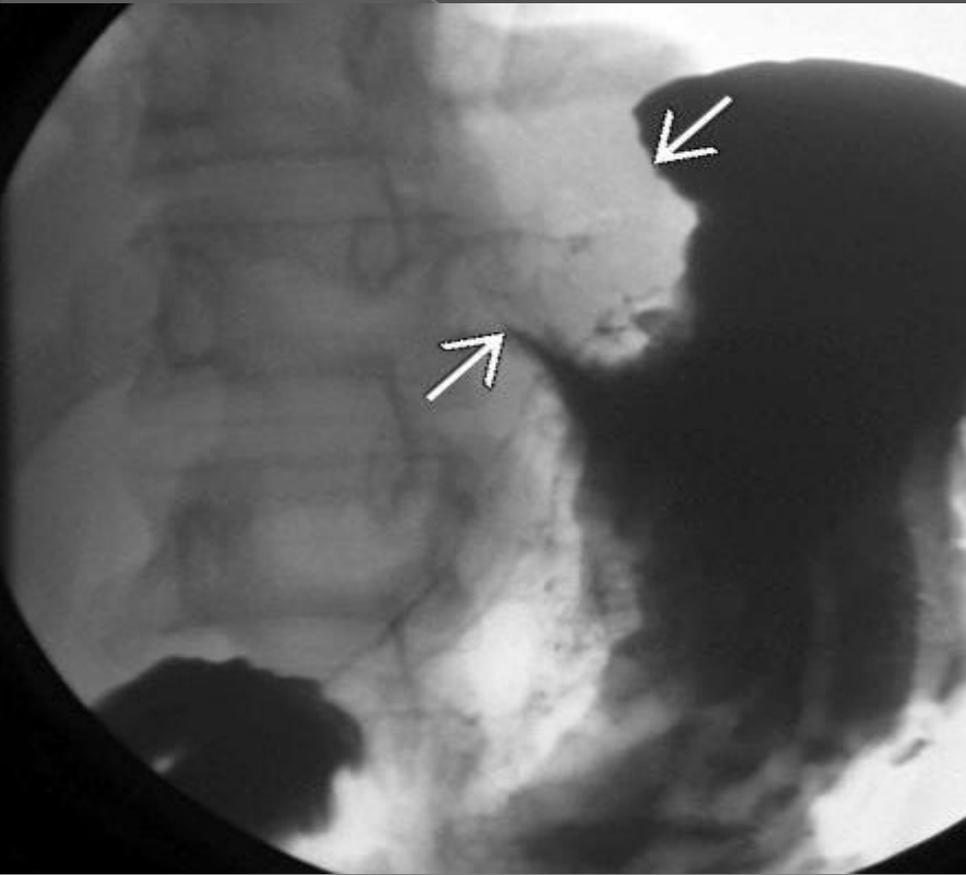
- > Central necrosis or hemorrhage common

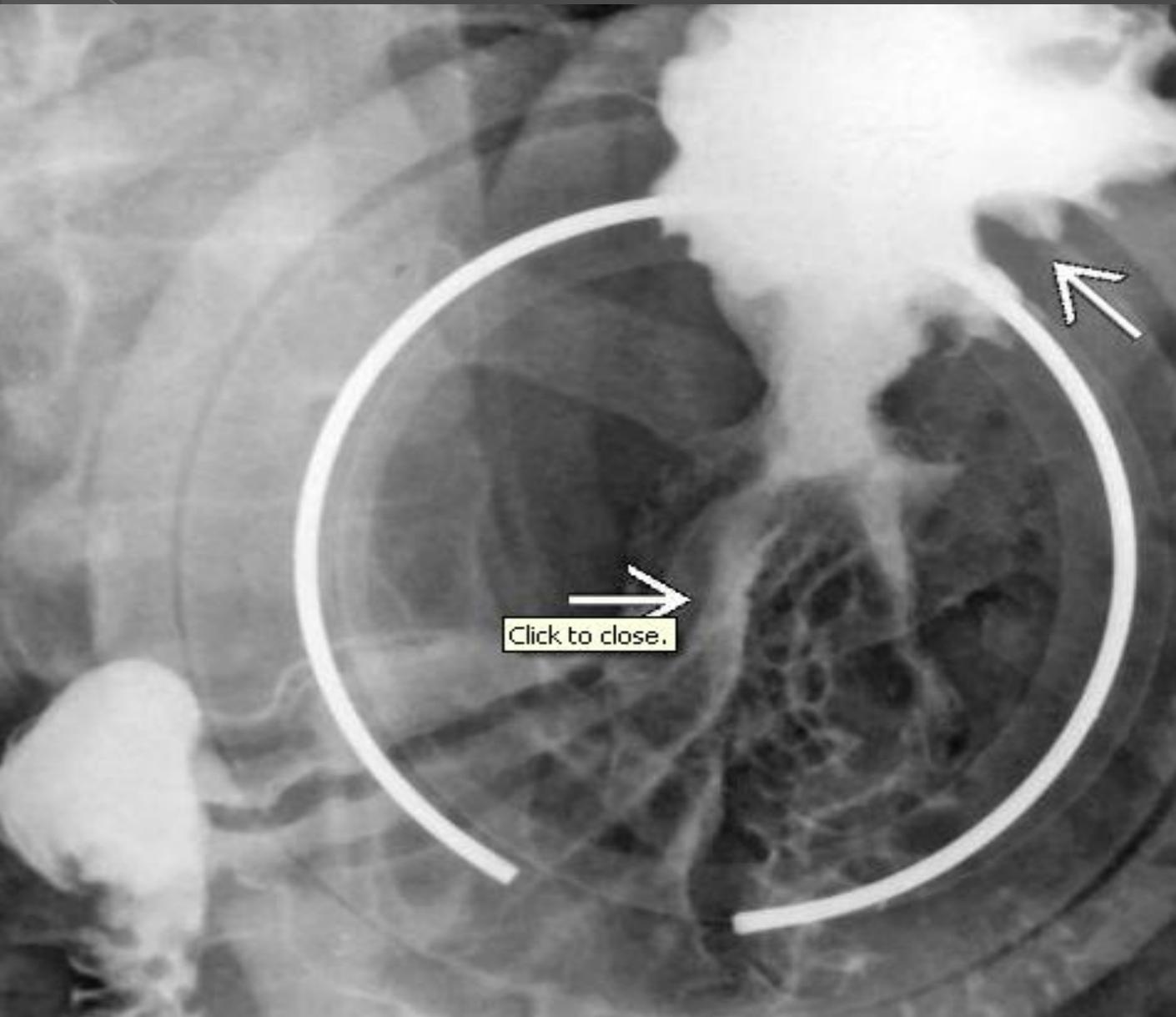
- > Smooth margins

- > Recurrence

- Nodule within a mass is a sign of recurrence

- One study reported nodule as first sign of disease progression in 17 of 21 patients





Malignancy
arising from
gastric
mucosa



- **Terminology**
- Malignancy arising from gastric mucosa
- **Imaging**
- Best diagnostic clue
 - > Polypoid or circumferential mass with no peristalsis through lesion
- Best imaging tool
 - > Double contrast barium study, NE + CECT, EUS
- **Top Differential Diagnoses**
- Benign gastric (peptic) ulcer
- Gastritis
- Gastric metastases and lymphoma
- Gastric stromal tumor
- Caustic gastritis
- Pancreatitis (extrinsic inflammation)
- Ménétrier disease
- **Pathology**
- Risk factors
 - > *H. pylori* (3-6x ↑ risk), pernicious anemia (2-3x ↑ risk)
 - > Diet heavy in nitrites or nitrates; salted, smoked, poorly preserved food
- **Clinical Issues**
- Most common signs/symptoms
 - > Anorexia, weight loss, anemia, pain; can be asymptomatic
- Diagnosis by endoscopic biopsy and histology
- **Diagnostic Checklist**
- Image interpretation pearls
 - > Can be ulcerative, polypoid or infiltrative (scirrhous type) + local and distant metastases
- **TERMINOLOGY Definitions**
- Malignancy arising from gastric mucosa
- **IMAGING General Features**
- Best diagnostic clue: Polypoid or circumferential mass with no peristalsis through lesion
- Morphology: Polypoid, ulcerated, infiltrative lesions



- **Fluoroscopic Findings**

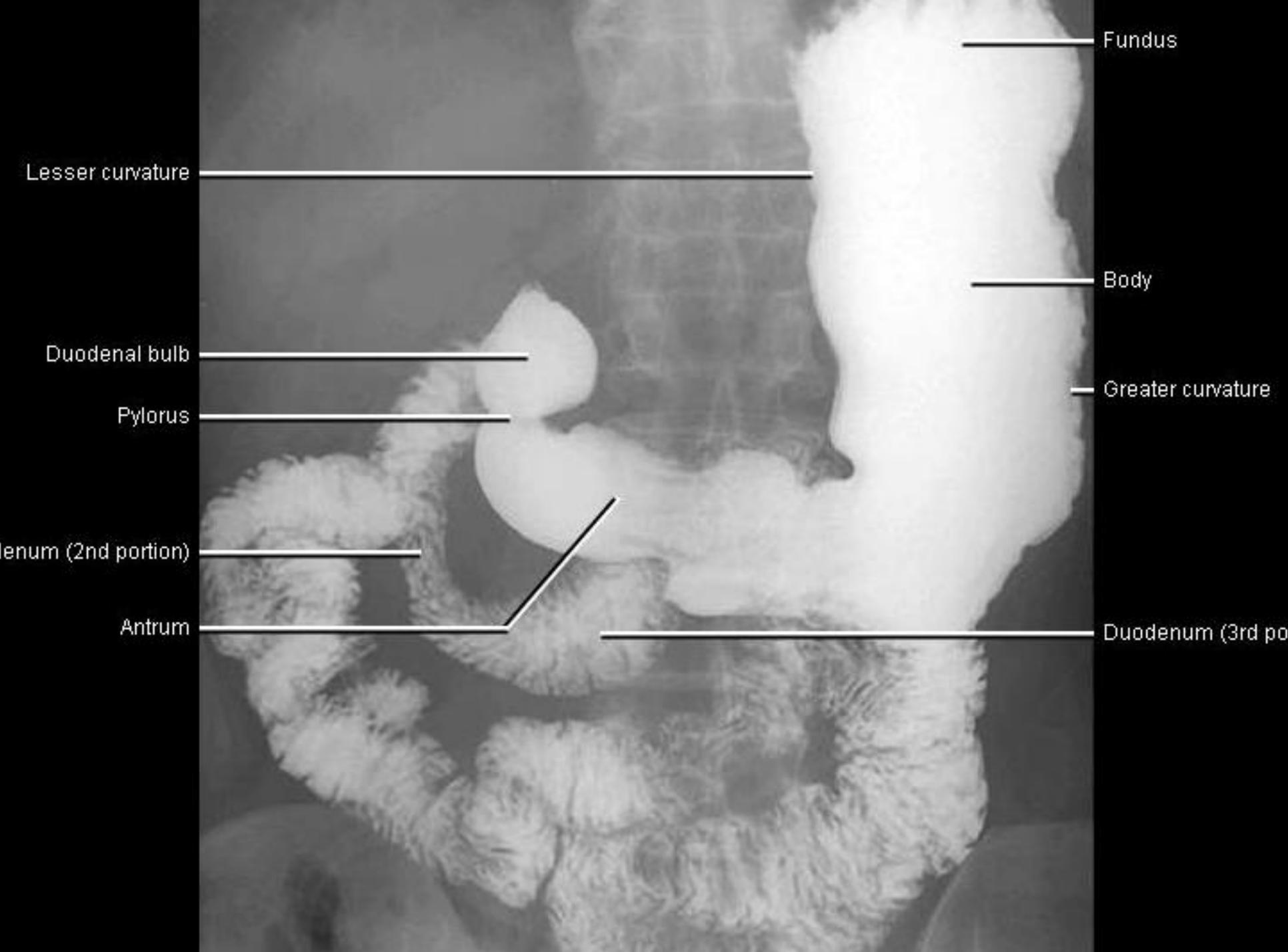
- Early (elevated, superficial, shallow)
 - > Type 1: Elevated polypoid lesion protruding > 5 mm into lumen
 - > Type 2: Superficial plaque-like lesion with mucosal nodularity/ulceration
 - > Type 3: Shallow, irregular ulcer crater with adjacent nodular mucosa, clubbing/fusion/amputation of radiating folds
- Advanced
 - > Polypoid cancer can be lobulated or fungating
 - > Lesion on dependent or posterior wall: Filling defect in barium pool
 - > Lesion on nondependent or anterior wall: Etched in white by thin layer of barium trapped between mass and adjacent mucosa
 - > Prolapsed polypoid antral carcinoma into duodenum: Filling defect in barium pool
 - > Ulcerated carcinoma: 70% of all gastric cancers
- Malignant ulcer (in profile)
 - > Intraluminal location within tumor
 - > Tumor surrounding ulcer forms acute angle with gastric wall
 - > Clubbed/nodular folds radiating to edge of ulcer crater
- Malignant ulcer (en face)
 - > Irregular, scalloped, angular, stellate borders
 - > Converging folds to ulcer: Blunted, nodular, clubbed, fused
 - > Ulcer on nondependent/anterior wall: Double ring shadow (edge of tumor and edge of ulcer)
 - > Prone compression view: Filling of ulcer crater within discrete tumor on anterior wall
- Carman-Kirkland meniscus complex (lesser curvature antrum or body)
 - > Broad, flat lesion; central ulceration, elevated margins
 - > Prone compression view (mass on anterior wall): Radiolucent halo filling defect due to elevated edges; meniscoid ulcer-convex inner border, concave outer border
- Infiltrating: 5-15% of all gastric cancers
 - > Irregular narrowing of stomach with nodularity and mucosal spiculation
 - > May cause gastric outlet obstruction if advanced
- Scirrhous carcinoma (5-15%): Usually arise near pylorus, extend up
 - > Linitis plastica ("leather bottle"): Irregular narrowing/rigidity
 - Diffuse linitis plastica: Diffuse infiltration (nodularity, spiculation, ulceration, or thickened irregular folds)
 - > Localized tumor: Short, annular lesion/shelf-like proximal borders in prepyloric region of antrum

- **CT Findings**

- Negative contrast agents (water or gas) facilitate visualization of lesions
 - > Polypoid mass ± ulceration
 - > Focal wall thickening with mucosal irregularity or focal infiltration of wall
 - > Ulceration: Gas-filled ulcer crater within mass
 - > Infiltrating carcinoma: Wall thickening + loss of normal rugal fold pattern
 - Wisp-like perigastric soft tissue stranding: Perigastric fat extension
 - > Scirrhous carcinoma: Markedly enhancing thickened wall on dynamic CT
 - > Mucinous carcinoma: ↓ attenuation of thickened wall (↑ mucin); calcification seen
 - > Carcinoma of cardia: Irregular soft tissue thickening; lobulated mass



Narrowing in the pylorus because there due to a mass at the pylorus And the small dots next to it is the lymphnodes.



Fundus

Lesser curvature

Body

Duodenal bulb

Greater curvature

Pylorus

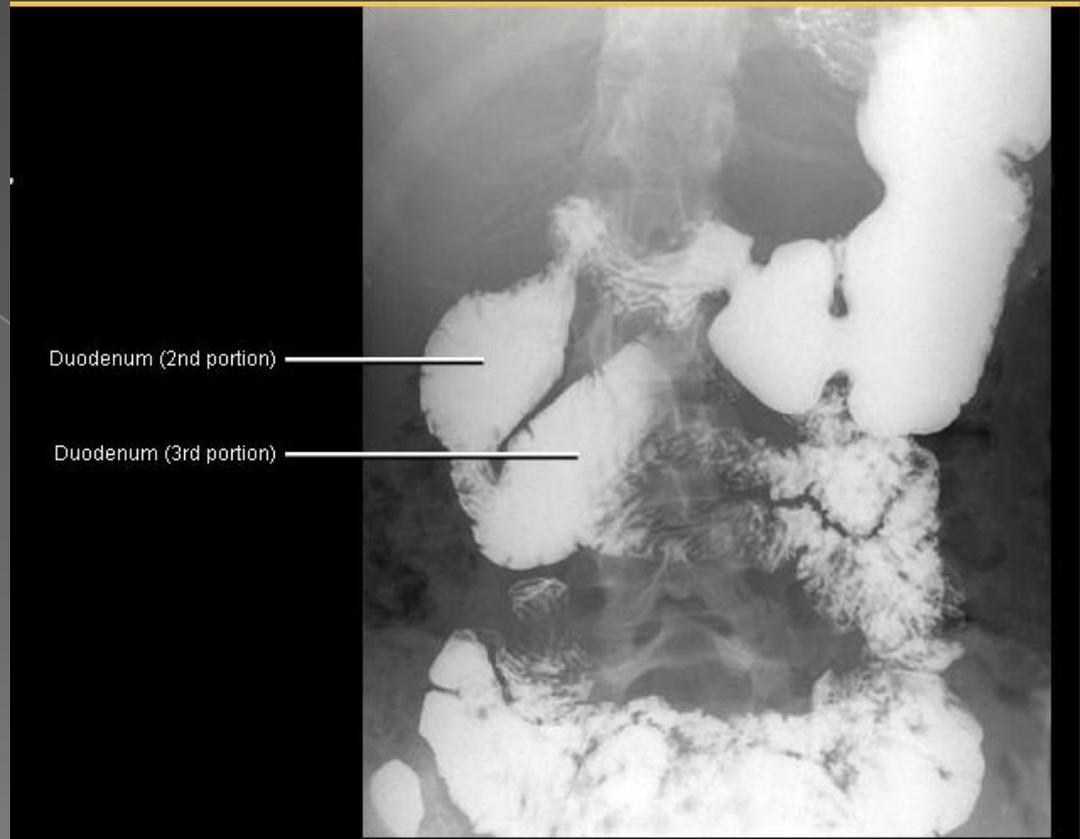
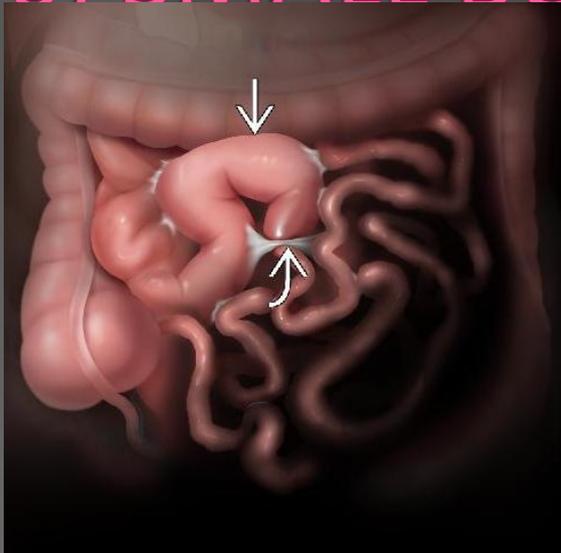
Duodenum (2nd portion)

Antrum

Duodenum (3rd portion)

- Ligament of treitz is the mark .. What's above it considered as an upper GI .. And what's below is a lower GI

6) SMALL BOWEL OBSTRUCTION



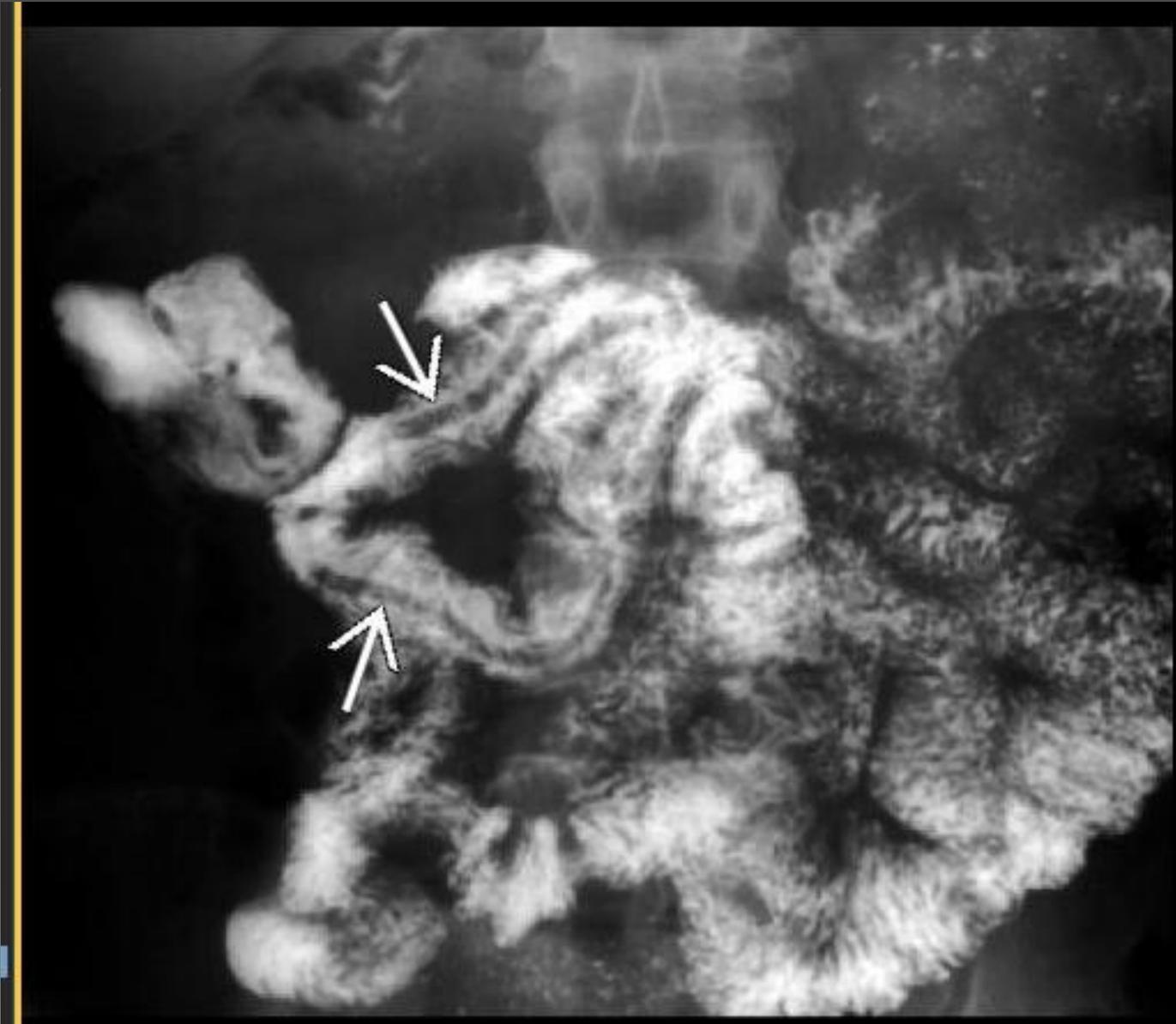


Transition point

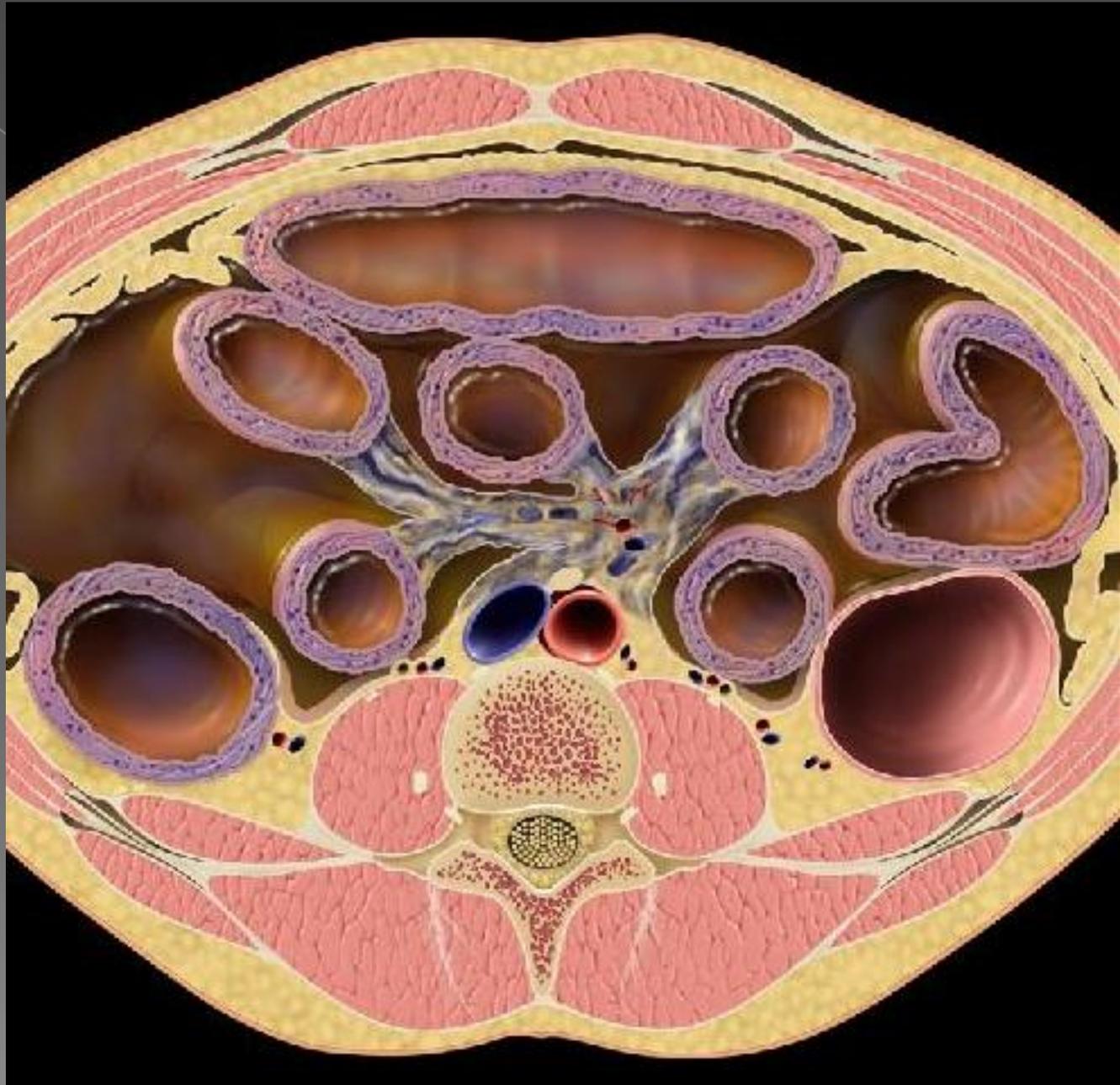
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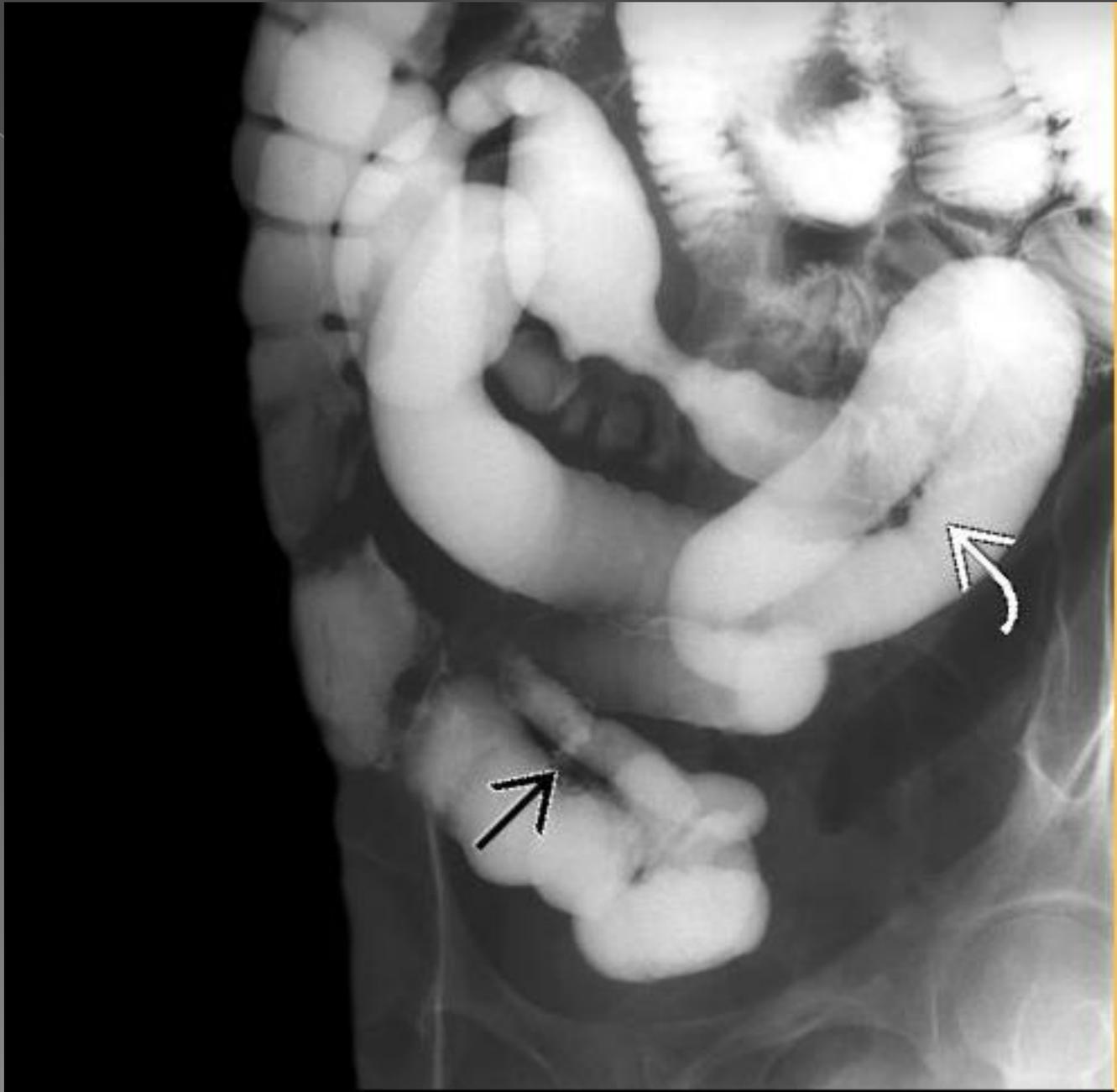
- A small bowel follow through study
- The transition point is the point that is between the normal and the abnormal
- What's before the transition point are dilated loops of bowel
- And what's after it are narrowed loops of bowel

- causes of small bowel obstruction:
 - 1- Adhesions
 - 2- Tumors
 - 3- Hernia
 - 4- Gall stone ileus (inflammation of the gallbladder that causes perforation to the small bowel and caused a distal obstruction)



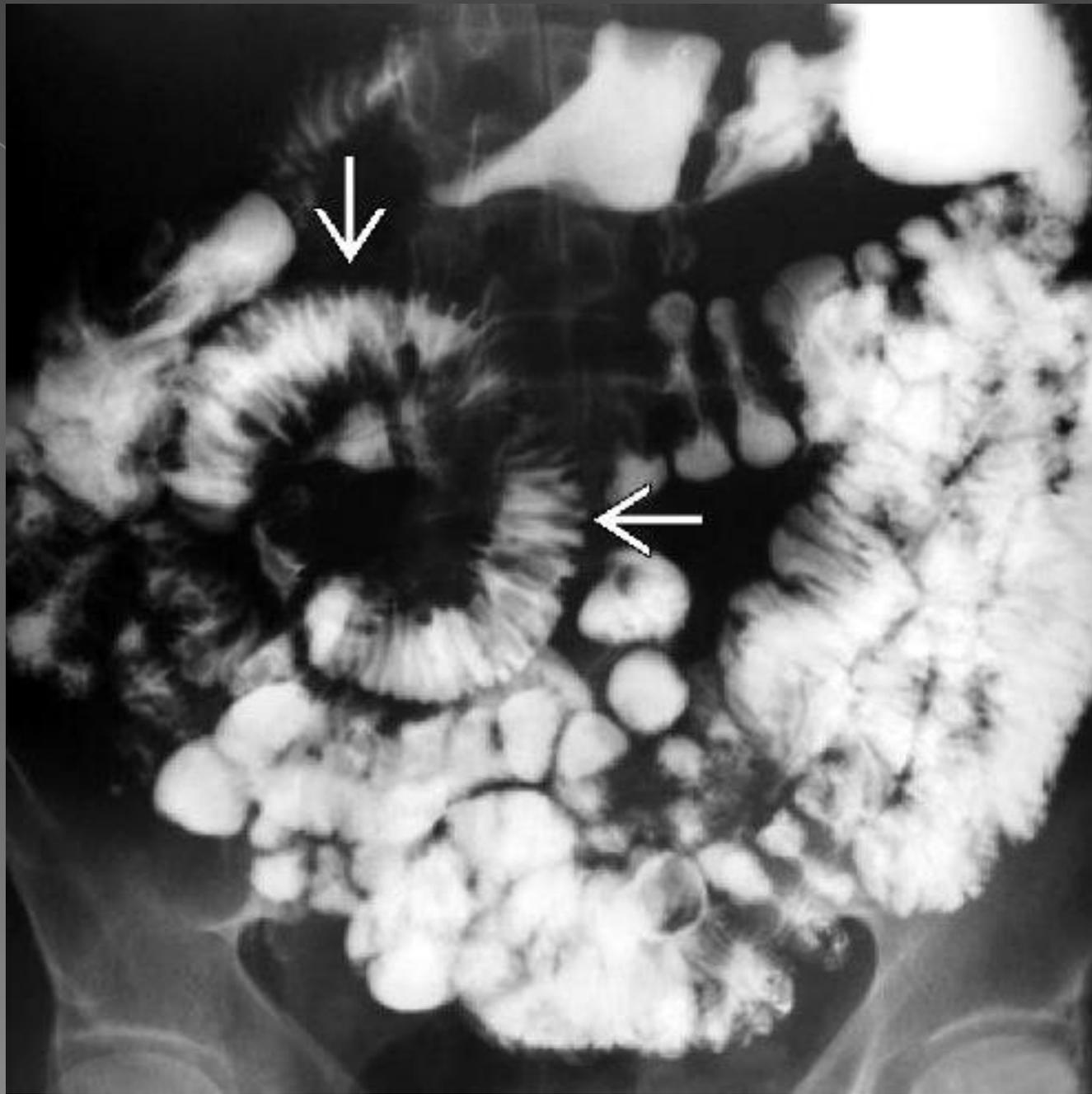














**Carcinoid
tumor (star
shaped =
stellate
shape)**

- 
- **Imaging: Most common primary small bowel tumor beyond ligament of Treitz**
 - **Appendix > ileum > duodenum > other sites**
 - **90% of small bowel carcinoids arise in distal ileum, 40-80% of SB carcinoids have spread to mesentery by time of diagnosis.**
 - **Duodenal and jejunal carcinoids have ↑ prevalence in MEN1 (multiple endocrine neoplasia)**
 - **Carcinoid syndrome = metastatic spread to liver Spectrum of symptoms (flushing, diarrhea, asthma, pain, right heart failure) Symptoms require systemic circulation of secretory factors produced by carcinoid**
 - **More difficult to detect primary than metastatic foci. Calcification within mesenteric mass (up to 70% of cases) Tumor may show spiculation with stellate pattern ± tethering, fixation, retraction of small bowel loops ± encasement and narrowing of mesenteric vessels.**
 - **Liver metastases: Arterial phase; intense enhancement (↑ vascularity) Washes out on portal venous and delayed phases In-111 octreotide or somatostatin receptor scintigraphy**
 - **Top Differential Diagnoses:**
 - > Sclerosing mesenteritis
 - > Infiltrated jejunal mesentery (not ileal)
 - > Intestinal metastases and lymphoma
 - > Desmoid Mesenteric and small bowel trauma
 - > Small bowel carcinoma
 - **TERMINOLOGY: Synonyms Gastrointestinal carcinoid (neuroendocrine tumor)**
 - **Definitions: Primary malignant neoplasm of small bowel arising from enterochromaffin cells of Kulchitsky**



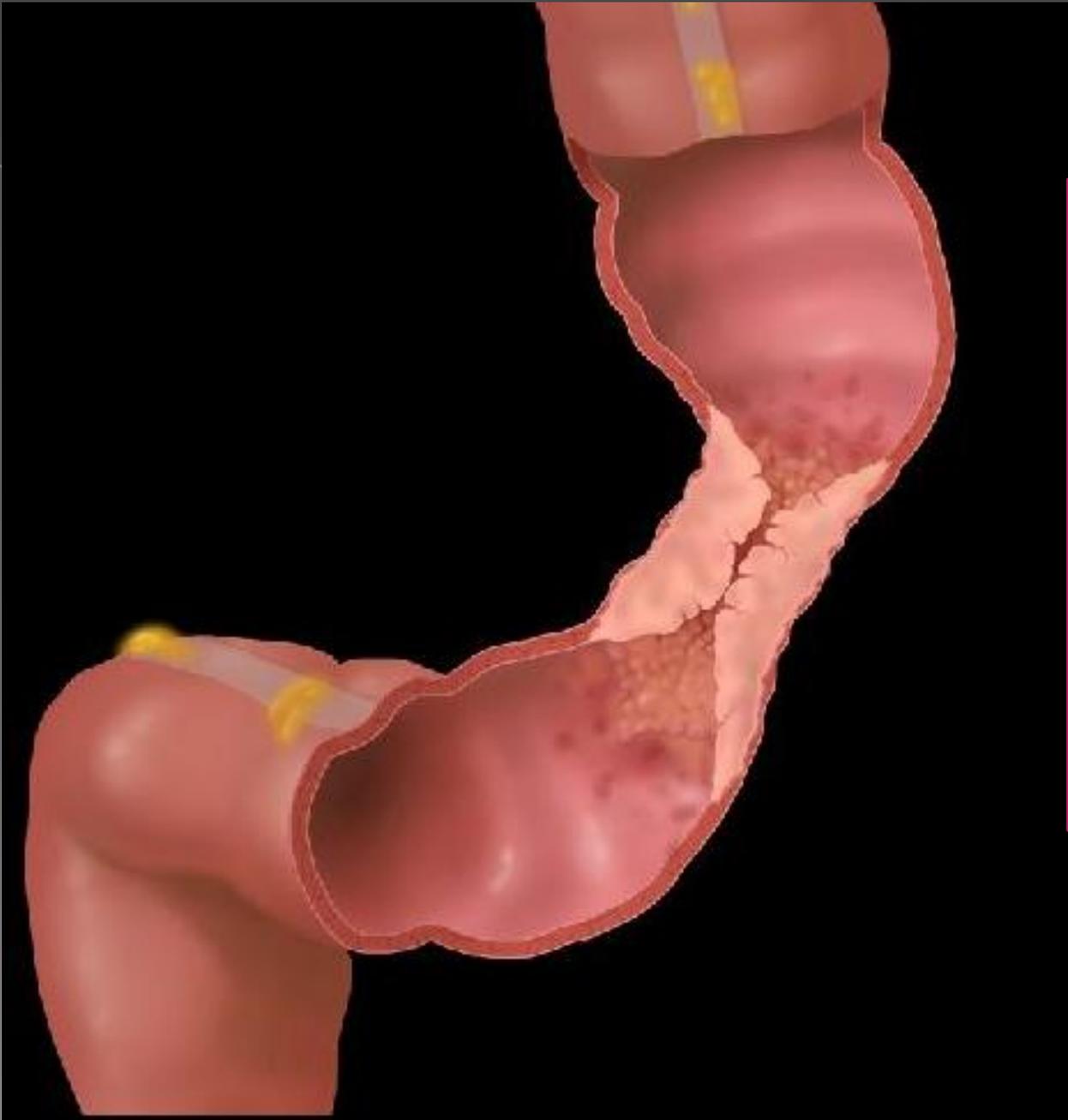
> **IMAGING**

- > **General Features: Best diagnostic clue: Solitary, well-/ill-defined, enhancing distal ileal mass with mesenteric metastases**
- > **Location: Appendix > ileum > duodenum > other sites**
- > **Size: Varies from < 1 cm to a few cm**
- > **Other general features**
- > **Most common primary small bowel (SB) tumor beyond ligament of Treitz, 2nd most common SB malignancy after adenocarcinoma, 85% of all carcinoid tumors arise within GI tract, Appendix (50%), usually incidental at appendectomy, Small bowel (33%); gastric, colon, & rectum (2%)**
- > **90% of small bowel carcinoids arise in distal ileum**
- > **15% of all carcinoids arise from pancreas, lungs, biliary tree, liver, genitourinary tract, and thymus**
- > **30% of small bowel carcinoids are multiple**
- > **Associated with MEN1, especially with duodenal and jejunal carcinoids**
- > **40-80% of SB carcinoids have spread to mesentery by time of clinical diagnosis**
- > **Key concepts**
- > **Carcinoid syndrome**
- > **Spectrum of symptoms (flushing, diarrhea, asthma, pain, right heart failure)**
- > **Often misdiagnosed for years**
- > **Indicates hepatic metastases, usually from small bowel tumor**
- > **Symptoms require systemic circulation of secretory factors produced by carcinoid**
- > **Serotonin, histamine, dopamine, somatostatin**
- > **Vasoactive intestinal polypeptide, substance P**
- > **Radiographic**

- Findings Fluoroscopic-guided small bowel series or enteroclysis Submucosal: Solitary or multiple, smooth filling defect in SB, Ulcerated submucosal tumor: "Target" lesion
- Thickening of wall and mucosal folds (extension) Mesenteric infiltration: Small bowel loops show angulation, tethering, fixation, and retraction Dilated and thickened bowel loops due to ischemia
- CT Findings: Submucosal tumors Solitary or multiple, well-defined enhancing lesion. Better visualization of enhancing mural mass with enteric water as contrast agent. More difficult to detect primary than metastatic foci
- Mesenteric extension of tumor Ill-defined, heterogeneous mesenteric mass Calcification within mesenteric mass (up to 70%) Occasionally tumor may be of cystic density
- Tumor may show spiculation with stellate pattern ± tethering, fixation, retraction of small bowel loops. Due to mesenteric fibrosis and desmoplastic reaction. Desmoplastic reaction: Finger-like projections of mass into adjacent mesentery ± encasement and narrowing of mesenteric vessels Liver metastases



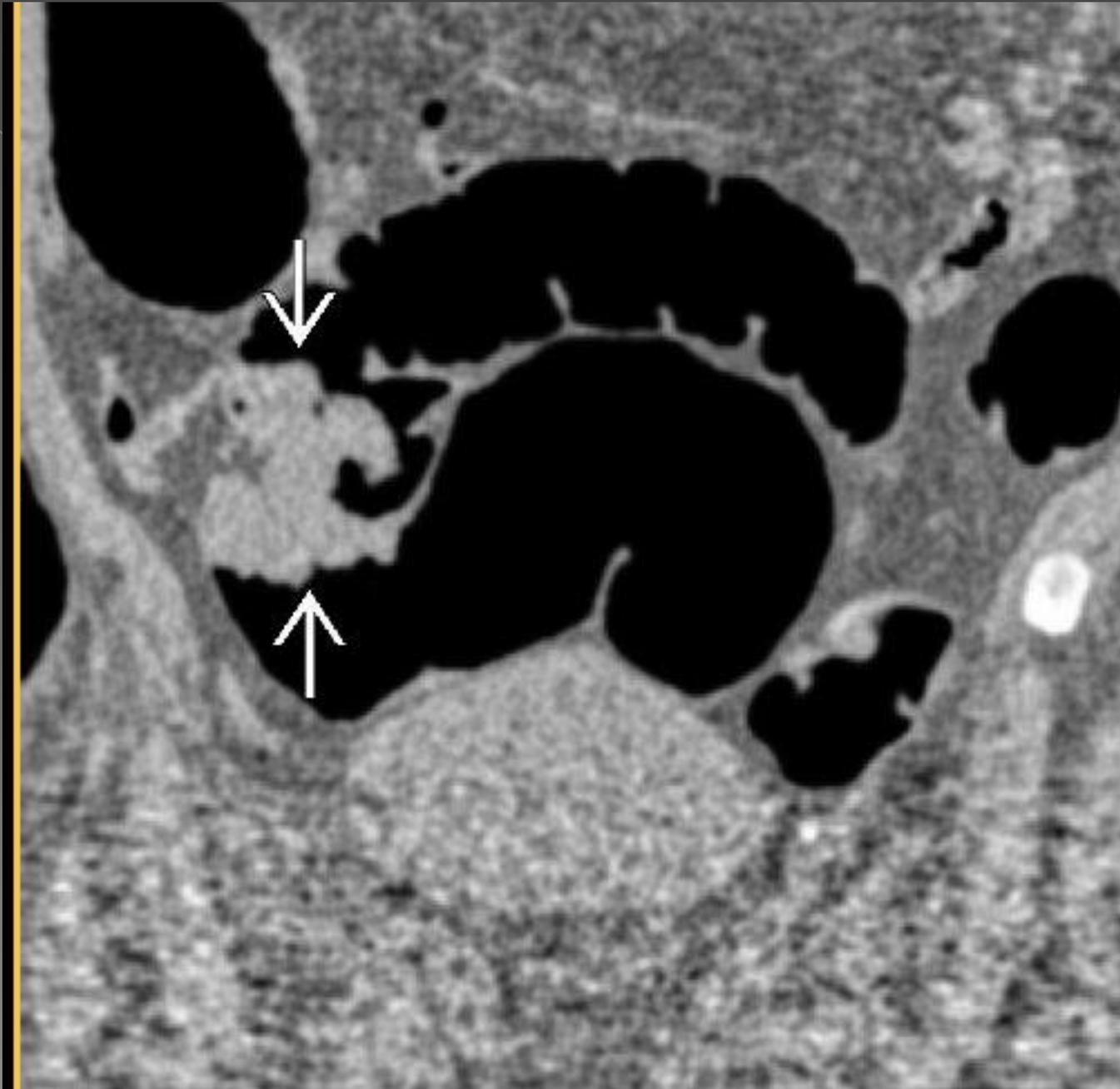
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- **Arterial phase: Intense enhancement (↑ vascularity)**
Delayed imaging: Iso- to hypodense to liver
3D CT angiography
Detects mesenteric mass & its relationship to vessels
Shows encasement or occlusion of mesenteric vessels ± bowel wall thickening and submucosal edema
Due to ischemia of involved small bowel loops
Small bowel mesenteric mass with calcification and desmoplastic reaction favors carcinoid tumor
Must be differentiated from treated lymphoma and retractile mesenteritis



Mucosal masses can cause small bowel obstruction (dilatation above , narrowing below)



- ◉ Double contrast
- ◉ Narrowing of the bowel and very little contrast is passing
- ◉ This shape is called (apple core lesion) = important -



CT for
staging of
colon and
rectal
cancer



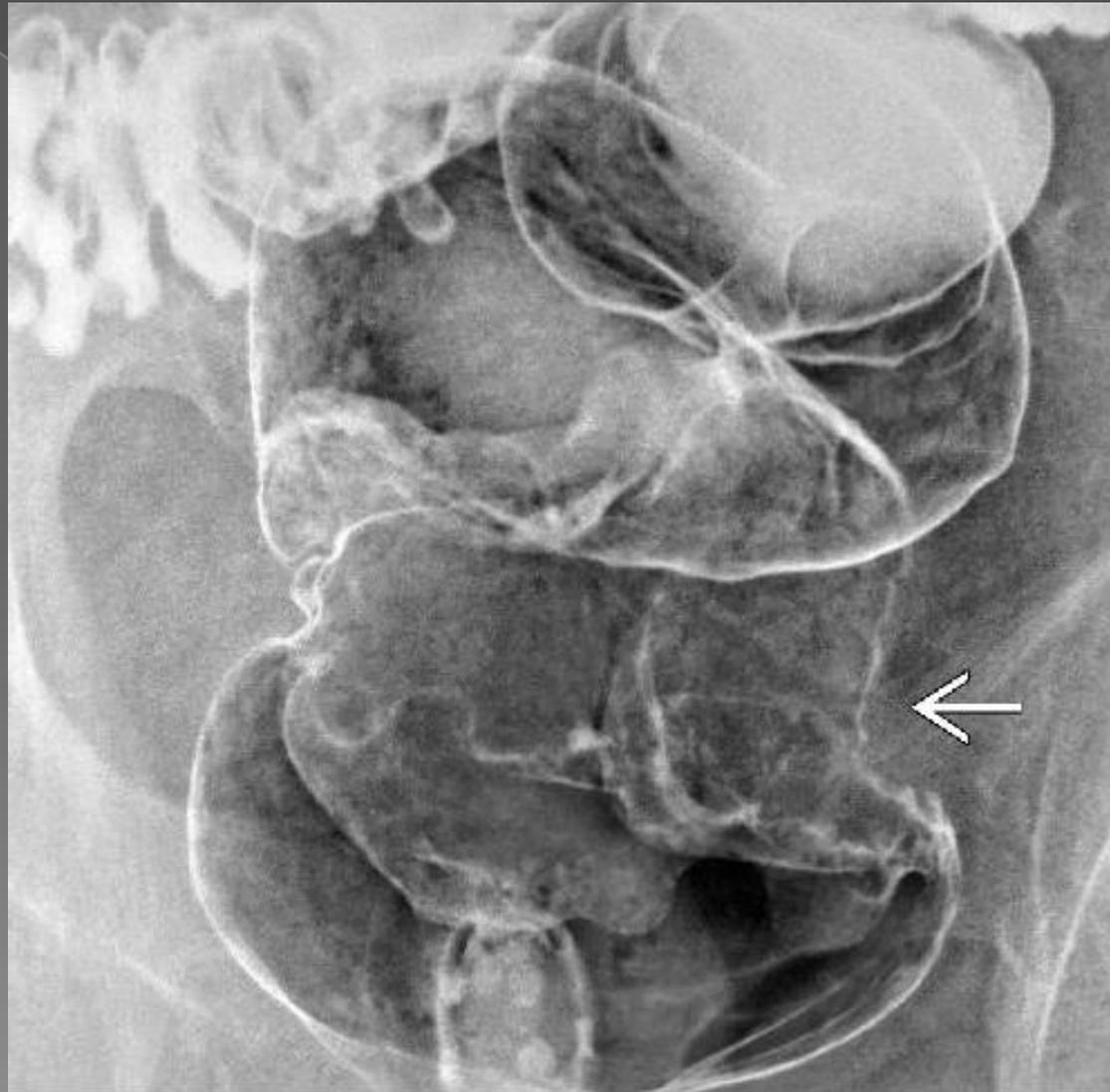
Metastatic
disease in
liver



Apple core lesion

The round white thing is a compressing pad to hold the bowel still for imaging MCQ !!!

7) Rectal cancer





- **Imaging CT, MR: Asymmetric mural thickening ± irregular surface**
- **Extracolonic tumor extension: Irregular external margin**
Strands of soft tissue extending from serosal surface into perirectal fat
Loss of tissue fat planes between rectum and surrounding muscles, organs.
Metastasis to lymph nodes at external iliac and paraaortic chain, inguinal, retroperitoneum, or porta hepatis. May have lung and bone metastases before liver metastases
Due to dual venous drainage, including internal iliac and hemorrhoidal veins
Mass; pericolonic infiltration, lymphadenopathy shown slightly better on MR than CT
- **Transrectal ultrasonography: Best for local invasion, pelvic nodes**
- **PET CT: Excellent for staging and recurrence**
- **Top Differential Diagnoses: Invasion by adjacent tumor (cervix, prostate, bladder)**
Rectal villous adenoma
Trauma or infection
Pathology
Adenocarcinoma: Mucin-producing glands (80% of rectal tumors)
Squamous cell (cloacogenic) carcinoma (20%)
- **Diagnostic Checklist**
Image detection of perirectal tumor spread is vital; requires preoperative radiation ± chemotherapy



- **Terminology: Definitions Malignant transformation of rectal mucosa**
- **IMAGING General Features**
- **Best diagnostic clue: Polypoid rectal mass with irregular surface**
- **Morphology Early cancer: Sessile or pedunculated tumors**
- **Advanced cancer: Annular, semiannular, polypoid or "carpet" tumors**
- **Most common in rectum: Sessile and polypoid**
- **Other general features Radiologic features are similar to colon carcinoma**
- **Radiographic Findings Fluoroscopic-guided barium enema**
- **Early cancer: Sessile (plaque-like) lesion** Most typical early colorectal cancer. Flat, protruding lesion with broad base and little elevation of mucosa (profile view) Discrete borders and shallow central ulcers (profile view) Curvilinear or undulating lines (en face view)
- **Early cancer: Pedunculated lesion** Short and thick polyp stalk Irregular or lobulated head of polyp



- **Advanced cancer: Polypoid lesion, Dependent wall: Filling defect in barium pool, Nondependent wall: Etched in white**
- **Advanced cancer: Semiannular ("saddle") lesion, Transition to annular carcinoma, Convex barium-etched margins (profile view) Advanced cancer: Annular ("apple core") lesion. Circumferential narrowing of bowel; shelf-like, overhanging borders (mucosal destruction) High-grade obstruction and ischemia: "Thumb printing" of dilated proximal colon**
- **Advanced cancer: "Carpet" lesion Malignant villous tumor may appear as "carpet" lesion with minimal protrusion into lumen. Radiolucent nodules surrounded by barium-filled grooves; finely nodular or reticular pattern CT Findings Mass and focal or circumferential wall thickening, asymmetric mural thickening ± irregular surface. Rectal wall thickening > 6 mm, extracolonic tumor extension, mass with irregular external border, strands of soft tissue extending from serosal surface into perirectal fat, loss of tissue fat planes between rectum and surrounding muscles, organs**
- **Metastasis to lymph nodes at external iliac and paraaortic chain, inguinal, retroperitoneum, or porta hepatis May have lung and bone metastases before liver metastases due to dual venous drainage, including internal iliacs MR Findings Mass; pericolonic infiltration, lymphadenopathy shown slightly better than on CT Endorectal coil: Improves resolution but may not be worth effort**



Apple core
lesion due to
a colon
cancer(desc
ending colon
)







- Radiology is critical for screening, diagnosis, treatment, and follow-up of colorectal carcinoma
- Detection: Double contrast barium enema
- Early cancer: Sessile (plaque-like) lesion or thick, short polyp
- Advanced cancer: Large polyp, "saddle" or "apple core" lesion
- Staging: Helical CT asymmetric mural thickening ± irregular surface, pericolic fat infiltration; spread to adjacent organ, Metastases to mesenteric nodes, peritoneum, liver
- Tumor recurrence and surveillance: PET CT
 - > Top Differential Diagnoses: Diverticulitis Ischemic colitis, Infectious colitis, Ulcerative colitis, Endometriosis
 - > Pathology: Importance of family history CRC in 1st-degree relatives (↑ risk 2-3x)
 - > Familial adenomatous polyposis (accounts for less than 1% of all colon cancers)
 - > Hereditary nonpolyposis colorectal carcinoma (accounts for 5% of all colon cancers)
- Clinical Issues: New treatments for metastatic disease demand accurate staging and surveillance for recurrence PET CT is optimal in this setting
- TERMINOLOGY Abbreviations Colorectal carcinoma (CRC) Definitions Malignant transformation of colonic mucosa
- IMAGING General Features Best diagnostic clue: Short segment luminal wall thickening
- Location: Cecum (10%), ascending colon (15%), transverse colon (15%), descending colon (5%), sigmoid colon (25%), rectosigmoid colon (10%), rectum (20%)



- **Radiographic Findings:**
- **Fluoroscopic-guided double contrast barium enema**
- **Early cancer: Sessile (plaque-like) lesion, Typical early colon cancer, flat, protruding lesion with broad base and little elevation of mucosa (in profile view) Discrete borders and shallow central ulcers (in profile view) Curvilinear or undulating lines (in en face view)**
- **Early cancer: Pedunculated lesion short and thick polyp stalk irregular or lobulated head of polyp**
- **Advanced cancer: Polypoid lesion (large) Dependent wall: Filling defect in barium pool**
- **Nondependent wall: Etched in white**
- **Advanced cancer: Semiannular ("saddle") lesion. Transition to annular carcinoma: Polypoid → semiannular → annular Convex barium-etched margins (in profile view)**
- **Advanced cancer: Annular ("apple core") lesion, Circumferential narrowing of bowel: Shelf-like, overhanging borders (mucosal destruction) High-grade obstruction and ischemia: "Thumbprinting" of dilated proximal colon**
- **Advanced cancer: Carpet lesion, Malignant villous tumor may appear as carpet lesion with minimal protrusion into lumen, Radiolucent nodules surrounded by barium-filled grooves; finely nodular or reticular pattern**



- **Morphology**
- **Early cancer: Sessile or pedunculated tumors**
- **Advanced cancer: Annular, semiannular, polypoid, or carpet tumors**
- **Other general features: Radiology is critical for screening, diagnosis, treatment, and follow-up of CRC**
Screening: Fluoroscopic-guided double contrast barium enema or CT "virtual colonoscopy" are comparable to colonoscopy for cancer detection
- **CT Findings: Asymmetric mural thickening ± irregular surface, Wall thickness of distended colon: < 3 mm = normal; 3-6 mm = indeterminate; > 6 mm = abnormal, Tumor within lumen, Smooth outer bowel margins, Extracolonic tumor extension, Mass with irregular border, Strands of soft tissue extending from serosal surface into perirectal or pericolic fat, Loss of tissue fat planes between colon and surrounding muscles, Metastases to mesenteric nodes, peritoneum, Hepatic metastases most common**

8) CROHN'S DISEASE



Chron's can affect any part of the GI tract but the most common place is the terminal ileum

Inflammation in the bowel → fistula formation



Limiting
technique (
cone view)
to limit the
radiation to
the patient



CT angiogram (coronal) ileum is inflamed and there is a stricture this is why it is hyperdense, and enhancement.



MRI – better
than CT
because there
is no radiation

Terminal ileum
which is
markedly
inflammed

9)Ulcerative colitis



Ulcerative colitis is a disease that is confined to the rectum and large bowel



- **Terminology: Chronic, idiopathic, diffuse, inflammatory disease primarily involving colorectal mucosa and submucosa**
- **Best diagnostic clue: Pancolitis, decreased haustration, multiple ulcerations on barium enema**
- **Best imaging tool: Barium enema (single- and double-contrast); MDCT ± contrast**
- **Top Differential Diagnoses: Granulomatous colitis (Crohn disease) Ischemic colitis, Cathartic colon, Neutropenic enterocolitis**
- **Pathology: Greater risk of colorectal cancer in UC than Crohn colitis, Multiple carcinomas in 25% of UC cases**
- **Clinical Issues: Most common signs/symptoms: Relapsing bloody mucus diarrhea, fever, weight loss, abdominal pain and cramps**
- **Initial onset: 15-25 years (small peak at 55-65 years) Begins in rectum with proximal continuous extension to part or all of colon**
- **Diagnostic Check list: Consider UC in any patient with sclerosing cholangitis. Rule out other inflammatory diseases of colon**
- **TERMINOLOGY: Abbreviations: Ulcerative colitis (UC) Definitions: Chronic, idiopathic, diffuse, inflammatory disease primarily involving colorectal mucosa and submucosa**

- 
- **General Features** Best diagnostic clue: Pancolitis, decreased haustration, multiple ulcerations on barium enema
 - **Location:** Rectum (30%), rectum and colon (40%), pancolitis (30%), limited to mucosa and submucosa
 - **Morphology:** Narrow lumen, superficial ulcers, pseudopolyps "Lead pipe" colon and lack of haustra (chronic phase)
 - **Fluoroscopic Findings** Barium enema Acute Colorectal narrowing, incomplete filling (spasm + irritability) Fine mucosal granular pattern (edema/hyperemia) Mucosal stippling: Punctate barium collections and ulcers due to erosion of crypt abscesses, thickened and edematous haustra, flask-shaped "collar button" ulcers: Ulcers enlarge → configuration lost → mucosal islands and polyps Inflammatory and post inflammatory pseudopolyps Chronic Shortened colon, depressed flexures (reversible) "Lead pipe" colon blunted or complete haustral loss, Backwash ileitis: Inflamed distal 5-25 cm of ileum, Luminal narrowing and widened presacral space > 1.5 cm



IMAGING

- **Benign strictures: Local sequelae of UC Rectal valve abnormalities (double-contrast study)**
Lateral rectal view: At least 1 rectal valve should be visible fold usually seen at level of S3 and S4 (< 5 mm thick)
Proctitis: Valve thickness > 6.5 mm or absent
- **CT Findings NECT :Colorectal narrowing and widening of presacral space > 1.5 cm. Diffuse, symmetric colonic wall thickening < 10 mm Mural thickening and luminal narrowing in subacute or chronic cases CECT "Target" or "halo" sign**
Enhancing inner ring of bowel wall (mucosa)Non-enhancing middle ring of bowel wall (submucosa)Enhancing outer ring of bowel wall (muscularis propria)Enhancement of mucosal islands or inflammatory pseudopolyps; inflammatory pericolonic stranding
- **Imaging Recommendations: Best imaging tool: Barium enema (single- and double-contrast); MDCT ± contrast**







Treatment of ulcerative colitis is colectomy

To differentiate between the small and large bowel
The large bowel are usually at the periphery and the small bowel
are centrally

