

Color Index:

- ✓ Important
- ✓ Notes
- ✓ Extra

[Editing File](#)

Radiology of GI system diseases

objectives:

- To know common GIT Pathologies presentation.
- To understand step wise approach in requesting GIT Radiology Investigations.
- To know common Radiologic pathologies in GIT.

Sources

Lecturer:

[Dr.Mohammed Ayesh](#)

Same 436 lecture Slides:

YES + Extra new slides

Done by:

- | | |
|--|--|
|  Dimah Alarifi. |  Dawood Ismail |
|  Balqees Alrajhi |  Saad Alhaddab |
|  Alanoud Alessa |  Abdullah Balobaid |

Revised by:

 Yazeed Al-Dossare



Esophagus:

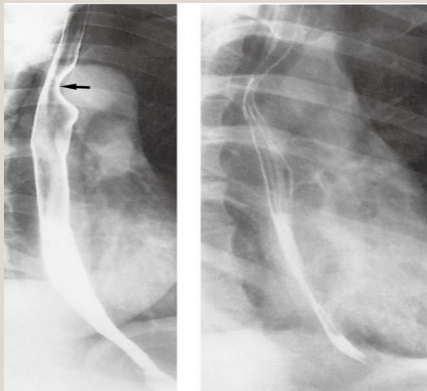
Clinical Signs and symptoms of Esophageal Disease:

- Dysphagia, Odynophagia (painful Swallowing).
- Regurgitations, Vomiting.
- Age (some diseases are common in specific age, a young patient will most likely have achalasia, but old one most likely have cancer).
- Constitutional symptoms (Fever, Night Sweat, Weight Loss).

Imaging modalities:

- X-ray.
- **Fluoroscopy (contrast study) "1st choice"** (Barium swallow = shows us the lumen and mucosal lining) we do not use it if we suspect perforation.
- Ultrasound (rarely used), and if we had to use it, we use the endoscopic not through the skin.
- CT we can use it, but it's not the study of choice.
- MRI (limited role).
- Nuclear Medicine > not used.
- Angiography > not used.

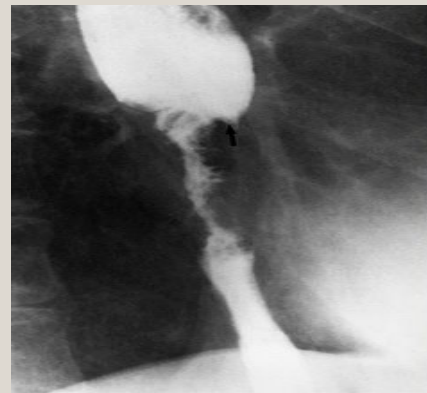
The most important thing in this lecture is to differentiate benign from malignant conditions.



Normal Esophagus

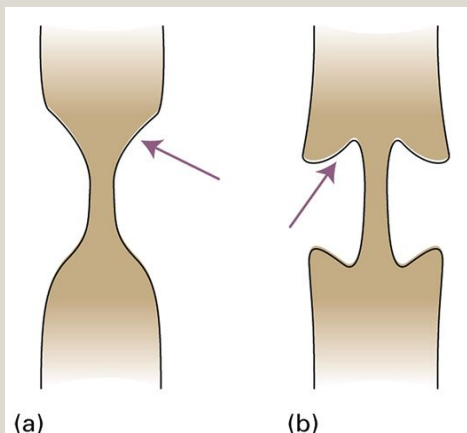
shows full Barium with a smooth outline and **indentation made by aortic arch**. Compare **Tapered** narrowing in the images

Normal oesophagus vs. Shouldering



Esophageal Carcinoma

Irregular narrowing in the mid of esophagus with **dilated** upper esophagus because of the narrowing (there is a mass constricting the lumen which gives **shouldering** at the upper end) always there is always dilatation before any stricture



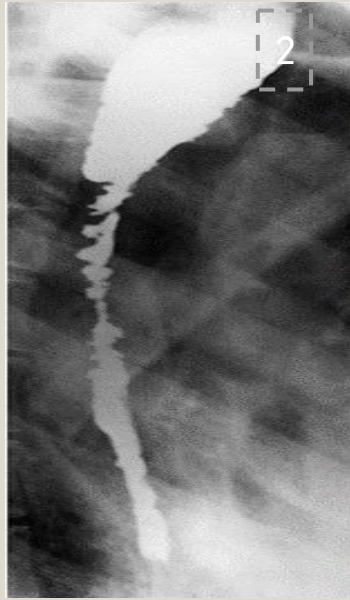
- a) Tapering ends.
- b) Overhanging edges or **shouldering** (shouldering indicates overgrowth of the wall "mass" so we can not see the wall clearly on barium swallow)

Esophagus: All studies in this page are barium swallow

436 Slides. not in ours



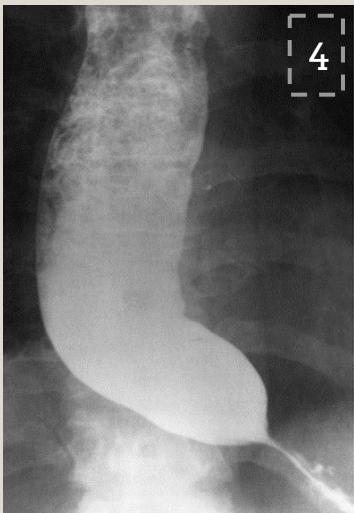
Peptic stricture due to GERD in a patient with hiatus hernia. There is smooth narrowing of the mid esophagus we see it in gastroesophageal junction with an ulcer within the stricture (arrow).
Tapered smooth focal stricture, no shouldering so benign



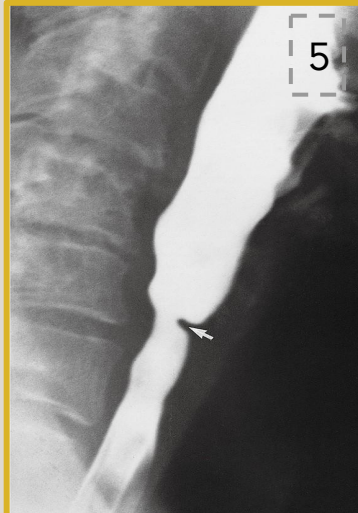
Corrosive Stricture
 Irregular narrowing in the whole esophagus with dilated inflow.
no shouldering > benign
 *Corrosive are chemicals like acids or bases.
 ممكن نشوفها عند اللي بيغى ينتحر ويشرب مواد حارقة



External posterior compression causes narrowing of esophagus due to apparent subclavian artery as it passes behind the esophagus (arrow) anomalous right subclavian artery.



Achalasia Most of esophagus is dilated with food residuals and smooth narrowing at the lower End. Rat tail and bird beak sign with no shouldering > benign

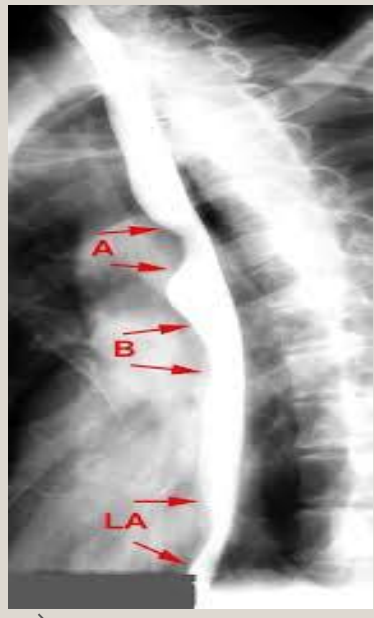


Esophageal web. Shelf-like indentation (arrow) from the anterior wall of esophagus, **no shouldering**



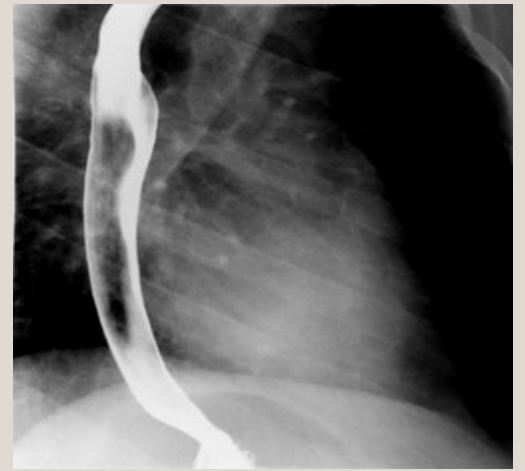
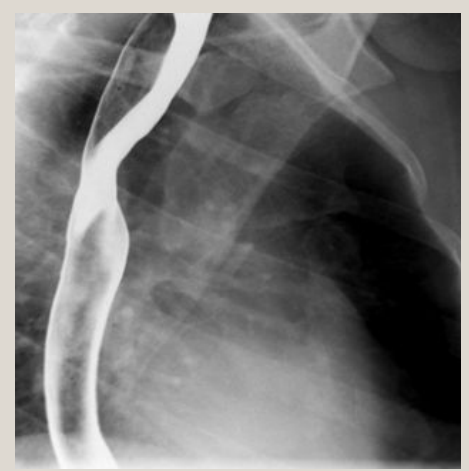
Pharyngeal outpouching filled with contrast with compression of the esophagus (Zenker's Diverticulum) In elderly

Esophagus:



This picture was taken from google (FYI)

- Aortic arch
- Left main bronchus
- Left atrium



Normal study- Double contrast



Esophageal Diverticulum

Stomach:

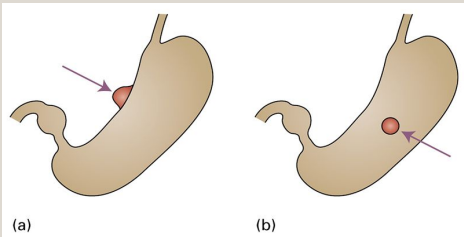
Clinical signs and symptoms:

- Epigastric pain.
- Vomiting.
- Hematemesis.
- Age (some diseases are common in specific age).
- Constitutional symptoms (Fever, Night Sweat, Weight Loss).

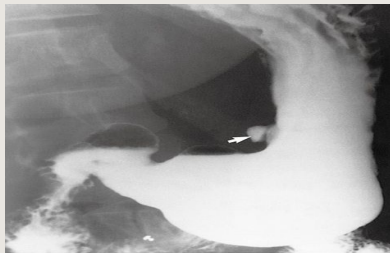
Imaging Modalities:

- X-ray.
- Fluoroscopy, contrast study (Barium meal).
(used to visualize stomach mucosa).
- Ultrasound > in pediatric for pyloric stenosis.
- CT.
- MRI.
- Nuclear Medicine > not used.
- Angiography > not used.

Different located gastric ulcers:



- a) In profile the ulcer is seen as an outward projection
b) En face (facing forward, out profile) the ulcer appears rounded



Benign ulcer due to its regular lining
Up: In profile ulcer, **outpouching filled with contrast** in the lesser curve of the stomach (arrow).

Down: En face of an ulcer (arrow) is seen as rounded collection of barium, **زِي الحفر تدخل فيها الصبغة**.

Why do we see an ulcer as an outpouching? The ulcer makes the stomach walls weak, so it protrude outside the stomach.

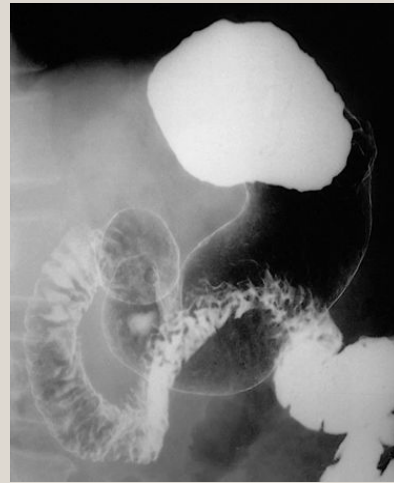
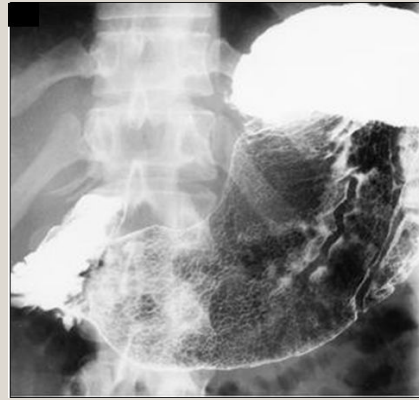
Notice the thin white lining (orange arrows) it represents the lesser curve, and the ulcer located far away from it, so it is En face ulcer.



Barium meal

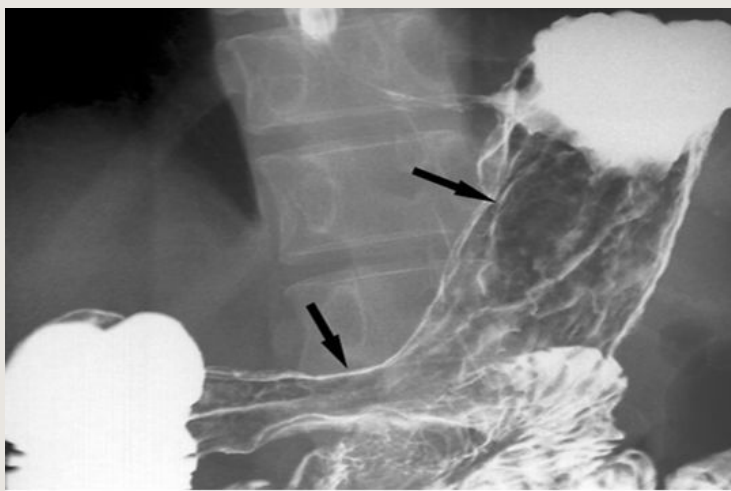


Normal Stomach and Duodenum on double contrast barium meal. On this supine view, barium collects in the fundus of the stomach. The body and the antrum of the stomach together with the duodenal cap and loop are coated with barium and distended with gas. Note how the fourth part of the duodenum and duodenojejunal flexure are superimposed on the body of the stomach.



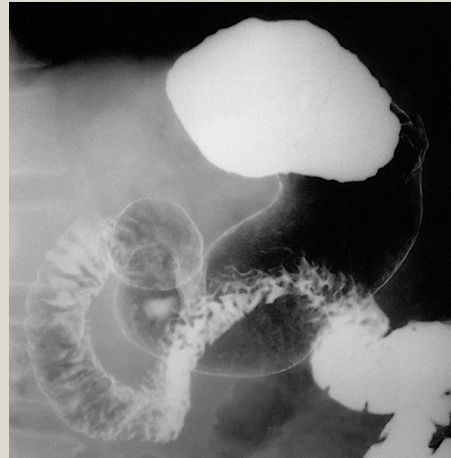
Normal Study-Double contrast

Gastric carcinoma



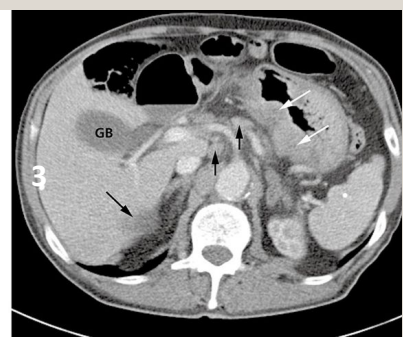
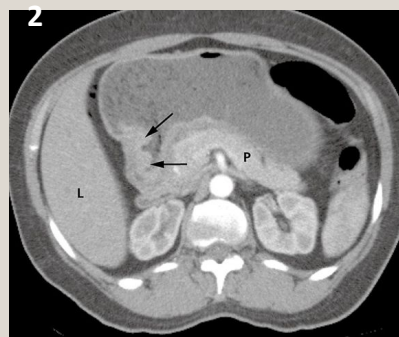
Significant narrowing of the gastric lumen

Gastric carcinoma



Gastric Carcinoma on Barium study (Left image), right image is normal (for reference)

Black areas (black clouds) are large **filling defects** in the antrum and body of stomach which indicates mucosal abnormality (**infiltration**). The difference between gastric masses and ulcer is that the ulcer will accumulate the contrast in ulcer site which will appear as dense but in case of mass, **the mass will clear the contrast and will appear black**.



Gastric Carcinoma on CT

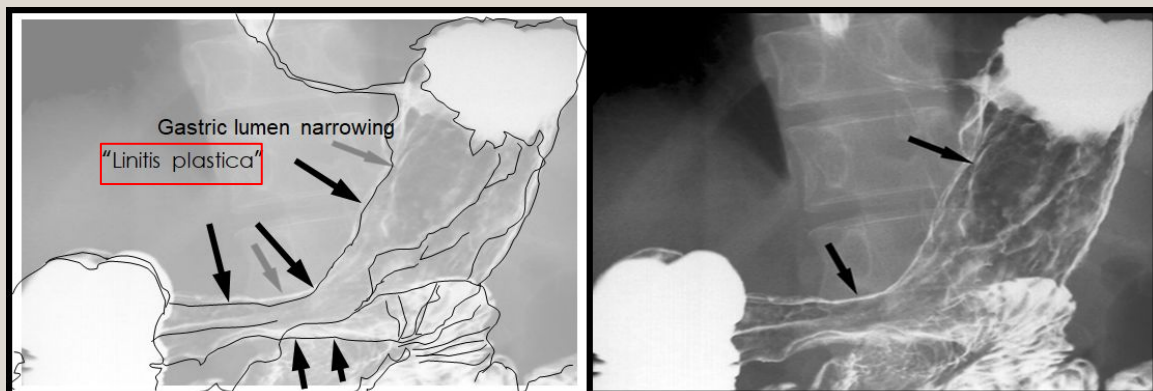
1- In the first picture (white arrows) indicate wall thickening, and it's what appeared in the barium study as filling defects.

2- Black arrows on **the second picture** indicate a focal ulcer arising in the antrum.

3- In **the third picture**, there is **diffuse thickening of the wall of the stomach** (white arrows), several lymph nodes (short black arrows in the middle) and a liver metastasis (long black arrow) are also seen.

These thickened walls could be: **1.Primary Gastric Cancer 2.Infiltration**

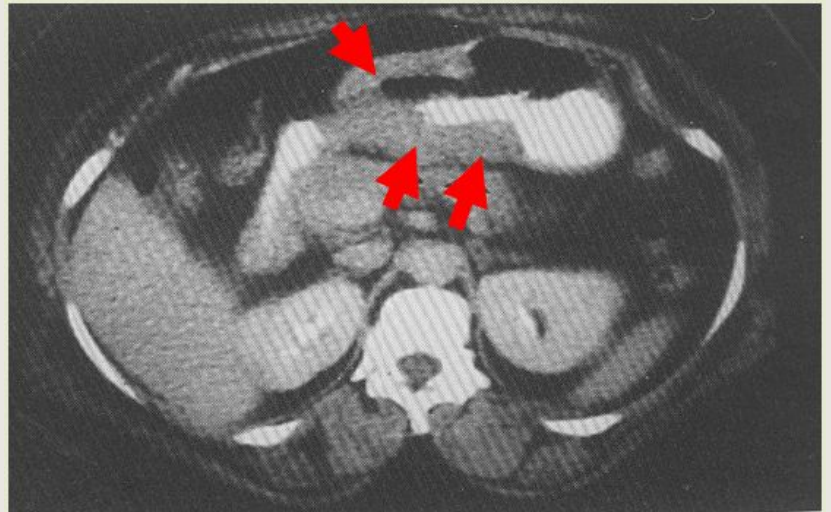
3.Metastasis 4.Lymphoma. (it is Gastric Carcinoma here) thickened walls and narrowed lumen with different axial levels.



Gastric lymphoma

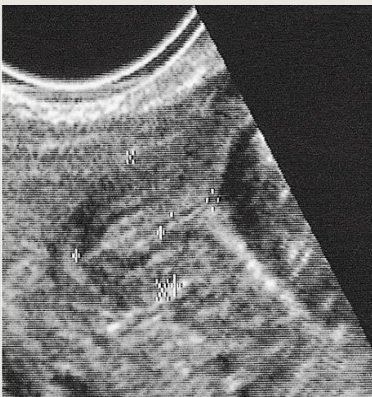


Shouldering of the stomach

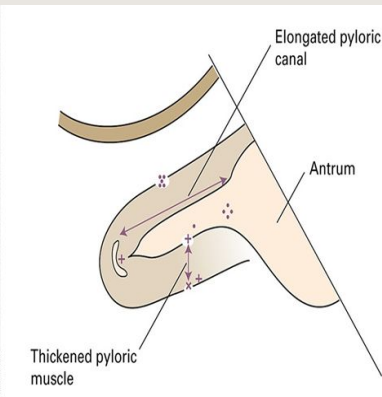


Thickening of the gastric wall

Pyloric stenosis



Pyloric stenosis. Ultrasound scan in a neonate showing a thickened, elongated pyloric canal



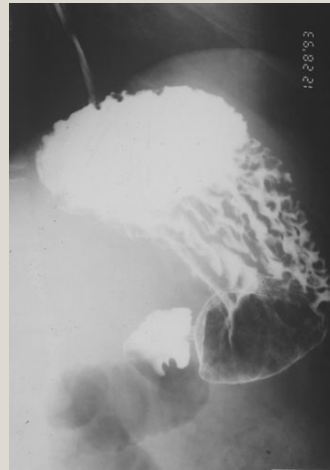
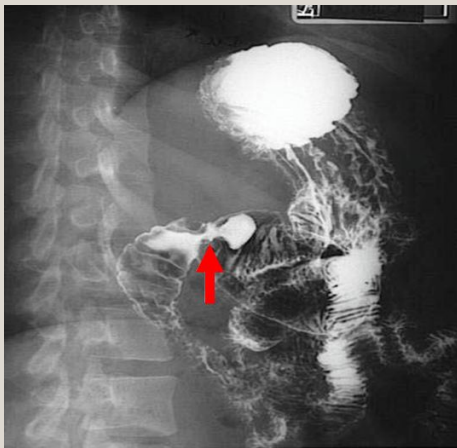
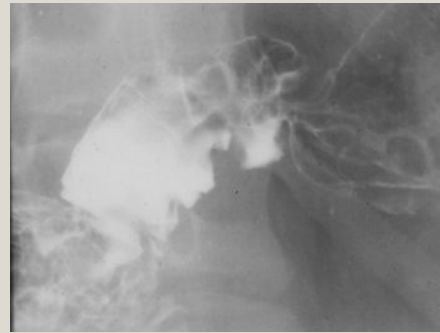
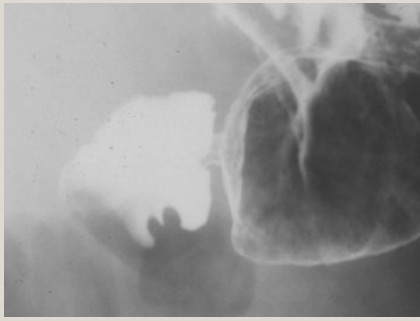
Ultrasound has very limited role in stomach but may play a role in **Pyloric Stenosis** in pediatric Age group.

Doctor's notes: usually the second male in the family, less than 6 weeks of age and presents with projectile vomiting and olive-shaped mass when feeling the upper belly which indicates the presence of **hypertrophic pylorus**.

Sliding hiatal hernia



Duodenal ulcer



Duodenal ulcer

Patient usually presents with Epigastric pain

Small bowel:

Clinical signs and symptoms:

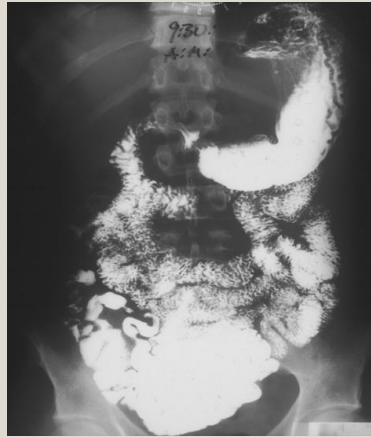
- Malabsorption.
- Vomiting.
- Diarrhea.
- Age (some diseases related to specific age).
- Constitutional symptoms (Fever, sweating and weight loss).

Imaging modalities:

- **X-ray** (Bowel obstruction and perforation) best initially.
- **Fluoroscopy** (Contrast study).
- **Ultrasound** (we don't use it because small bowel is filled with gas and US can't read gas).
- **CT** replacing the fluoroscopy these days.
- **MRI** replacing the Fluoroscopy and CT.
- **Nuclear medicine** > not used.
- **Angiography** > not used.



Normal fluoroscopic images of the small intestine

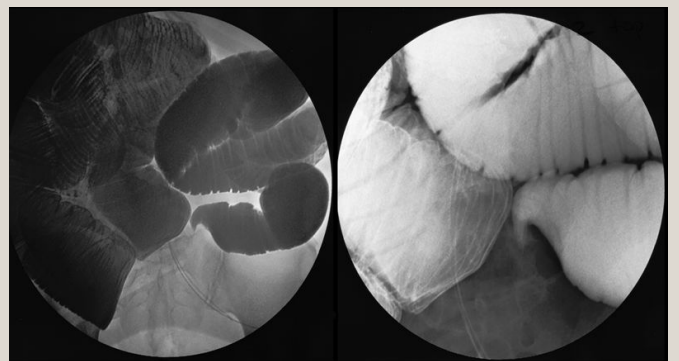


Normal barium meal- follow through

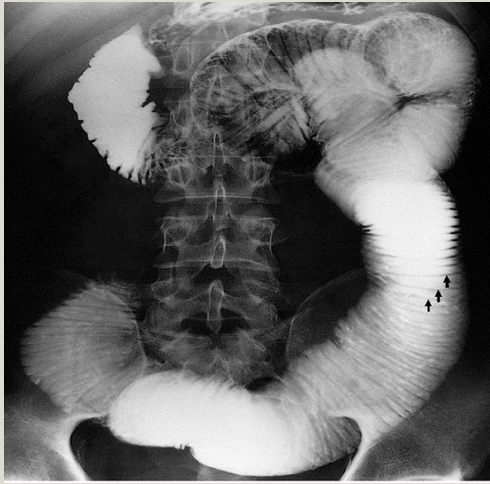


Normal small bowel enema

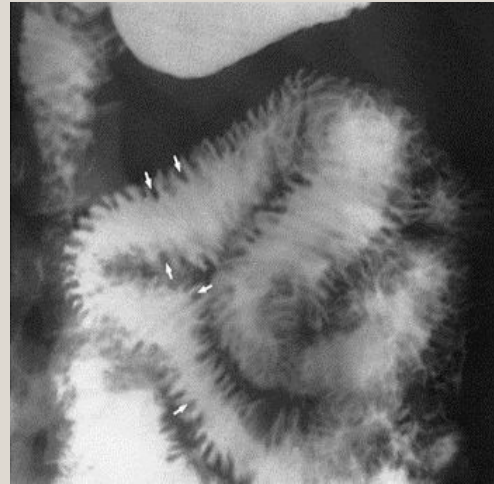
Small Bowel obstruction



- Small bowel enema :
- Dilatation from small bowel obstruction.
 - the diameter of the bowel is greatly increased. (Keep in mind that The upper limit of normal diameter of the bowel is generally accepted as 3cm)
 - The feathery mucosal pattern is lost, folds appears as thin lines traversing the bowel.(known as valvulae conniventes .arrows)



Significant **dilation** of the small bowel obstruction. The diameter of the wall is greatly increased. The feathery mucosal pattern is lost and the folds appear as thin lines traversing the bowel, known as valvulae conniventes. Notice the thinned mucosal pattern. Featureless, patient with (dilation + malabsorption = celiac disease)



Mucosal abnormality with **infiltration** of the bowel (in this case from oedema) **with thickening of the mucosal folds** (some are arrowed) Feathery, thumb-printing

Chron's disease



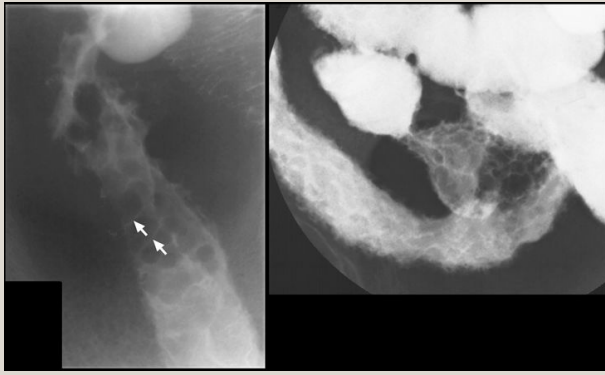
(mucosal ulceration the black spots in the picture) small erosions of the mucosal lining (**cobblestone sign**) سطح القمر المبعق



Deep Ulceration abnormal loops of bowel in crohn's disease showing the ulcers as outward projections (arrows). If the erosion extends to submucosa we will see the contrast filling the submucosa (**thorns rose**) Streak of contrast filing the wall

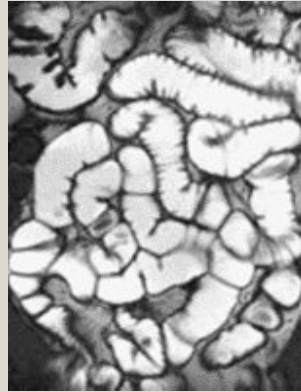
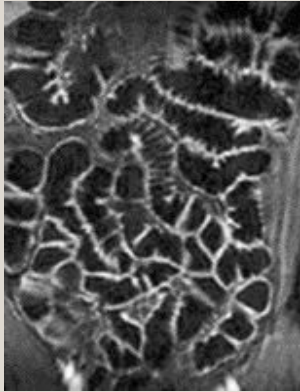


Note: both of these changes are seen in the crohn's disease (cobblestone sing & thorns rose)



FINDINGS:

Lumen narrowing & multiple stenotic segments (skip lesion)
 Deep Ulceration with mucosal edema in between Cobblestone Appearance
 Bowel loop separation (fibrofatty proliferation)

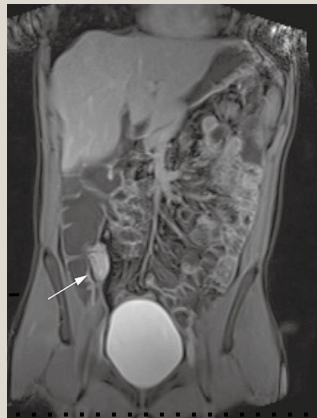


Normal MRI enterography

- Good details about mucosa, lumen and extra mesenteric fat. Most IBD cases nowadays are diagnosed using MRI enterography



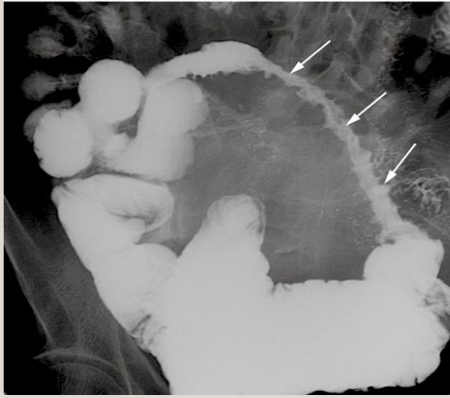
Coronal T2 post contrast image



Coronal T1 post contraste image

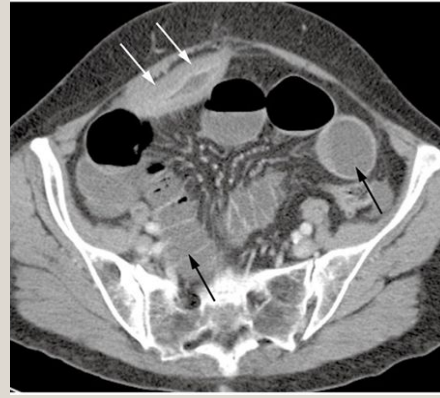
- Mucosal thickening and enhancement involving the terminal ileum (arrows), characteristic of **Crohn's disease**.
- Narrowing of the lumen and thickening in the wall of ileocecal junction are seen by MRI enterography.

Barium follow through



Narrowing. There is a long stricture (arrows) in the ileum due to Crohn's disease and an abnormal mucosal pattern. There is also separation of the abnormal segment from other loops of the bowel, with a narrowed lumen (arrows).

CT Scan



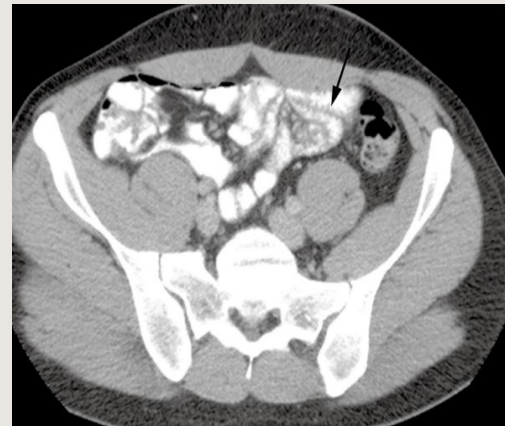
CT in the same patient demonstrating **marked thickening** of the abnormal loop of small bowel, with a narrowed lumen (white arrows). Several dilated loops of small bowel are also seen (black arrows), due to some obstruction at the level of the stricture.

Note: these changes are seen in the Crohn's disease.

Small bowel lymphoma



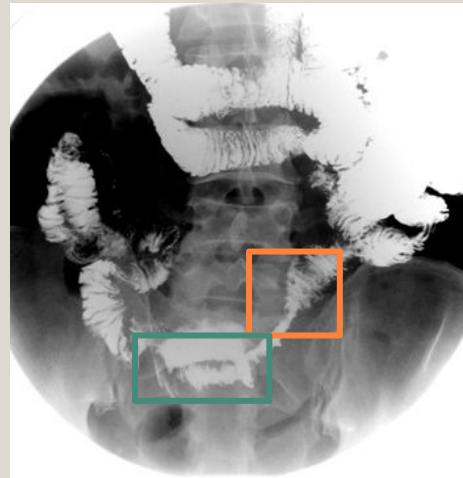
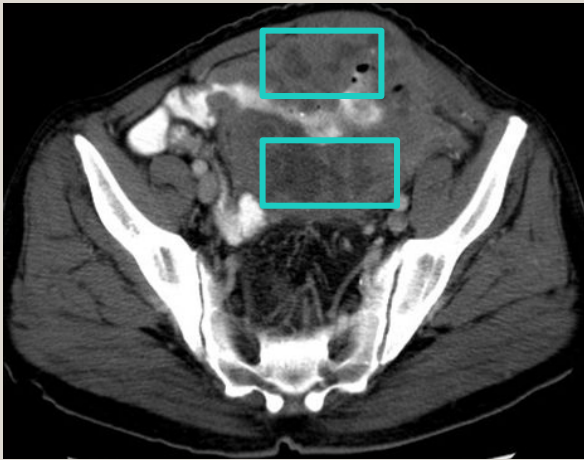
Normal smooth regular ileocecal junction



Normal CT scan of the small bowel



Lymphoma. CT with the bowel opacified by contrast agent. The wall of all bowel loops is considerably thickened. The arrows point to a portion of bowel which is particularly involved by lymphoma. Lumen surroundings are clear in CT. **Thickening** (more than 1 cm) is seen in the wall due to **infiltration** of any type of cells: (Malignant cells **lymphoma**) or any cause of infiltrative disease.



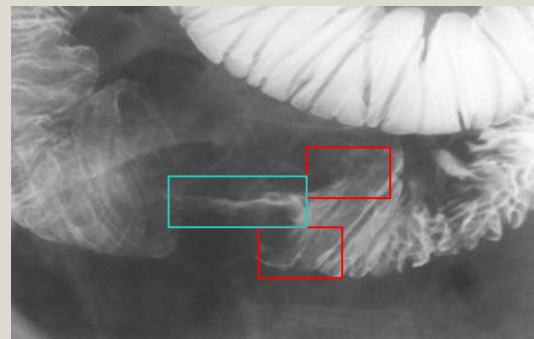
FINDINGS:

Lumen narrowing irregular

Mural wall thickening & bowel separation

Aneurysmal dilatation

Small bowel Cacinoma



Patient presents with Gi bleeding and weight loss

FINDINGS in small bowel enema:

Lumen narrowing irregular with ulceration & shouldering margins

Large bowel:

Clinical signs and symptoms:

- Abdominal Pain.
- Diarrhea.
- Hematochezia.
- Vomiting (not always).
- Anal pain and Discharge.
- Age (some diseases related to specific age).
- Constitutional symptoms (Fever, sweating and weight loss).

Imaging Modalities:

- X-ray. > for obstruction
- Fluoroscopy - Barium enema (Contrast study)
- Ultrasound (we don't use it because large bowel is filled with gas).
- CT.
- MRI.
- Nuclear medicine > not used.
- Angiography > not used.



Normal appearance of **double contrast** in the colon and it has normal mucosal lining and **Haustration**. Normally, haustration must be seen clearly in ascending and transverse colon



Normal large bowel study.
Double contrast



Normal large bowel study.
Single contrast

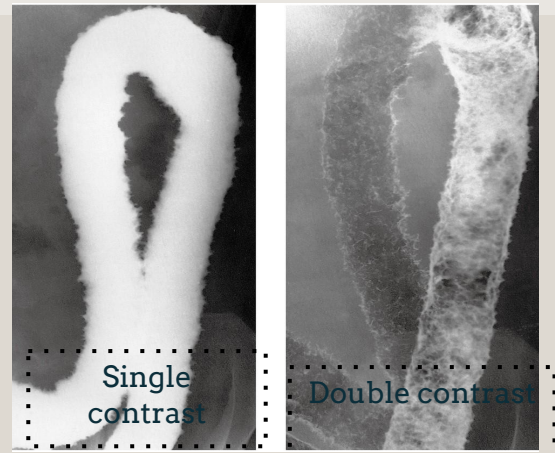
Ulcerative Colitis:



Ulcerative colitis with longstanding disease.

We can see clearly the **lead pipe appearance**, and reflux into the ileum through an incompetent ileocecal valve has occurred.

We know the incompetence of the valve by the backflow of the contrast from the colon into the ileum + **NO HAUSTRA**.



Ulceration. In this case of ulcerative colitis, the ulceration causes the normally smooth outline of the colon to be irregular. **NO HAUSTRA** which indicates ulceration due to repeated episodes of inflammation.

Double contrast study shows multiple mucosal black dots represents mucosal ulceration causes the normally smooth outline of the colon to be irregular.

Appendix



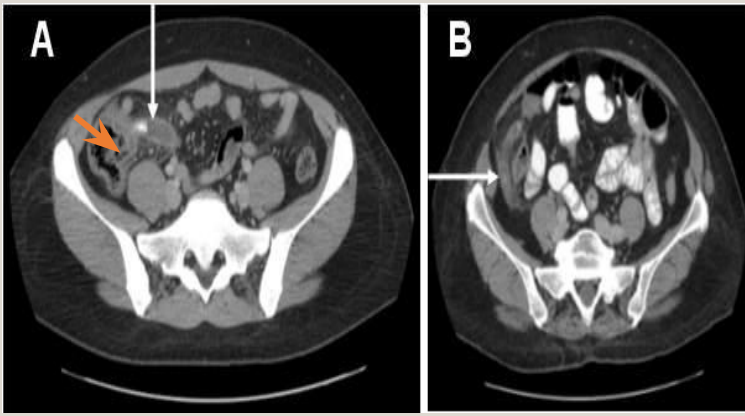
CT scan showing Normal appendix

Young healthy male complaining of right iliac fossa pain with leukocytosis and fever.

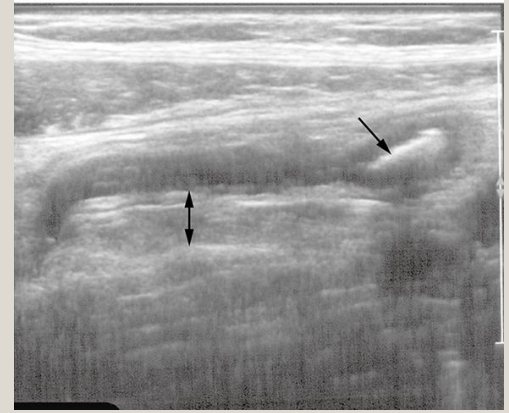
What is the Diagnosis? **Appendicitis.**

What is the best modality to diagnose ?

CT Scan (If it is a pregnant lady or pediatric patient then we do ultrasound).



- Blind ended tube in right iliac fossa. could present with white spot.
- Enlarged appendix measures **more than 6mm**.
- **Appendicolith** the white spot in the appendix (orange arrow in image A), The white arrow points at the appendix.
- The complications of acute appendicitis: **perforation, abscess formation and mass formation**.tient has appendicitis!!!



Appendicitis

- In **US** there is **thickening** of the wall (double headed arrow) and we can see **appendicolith** in the tip of the appendix (single headed arrow).
- **CT** has higher sensitivity than **US** is assessing appendix but in situations like (pregnant lady or neonate) we can use **US** with 60% sensitivity.



Appendicitis

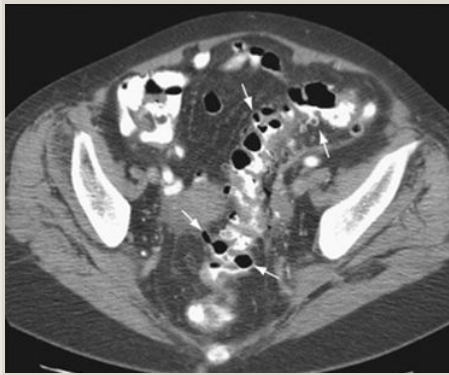
(longitudinal US scan, US can be longitudinal or transverse) there is **marked thickening of the wall of appendix** (double headed arrows) fluid is seen within the lumen and surrounding the appendix (white arrows).

Colonic diverticulosis

Hx of abdominal pain.



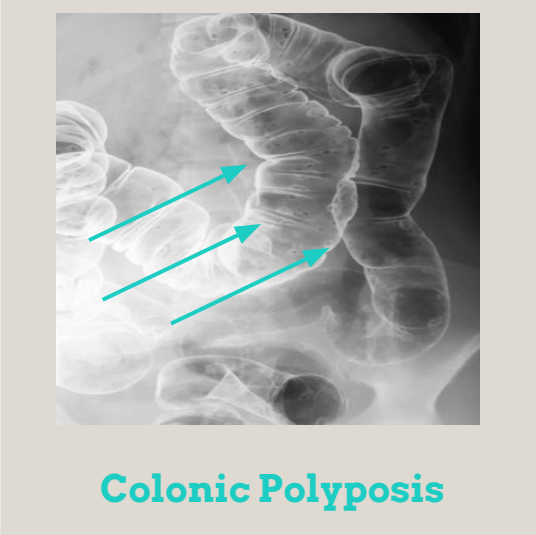
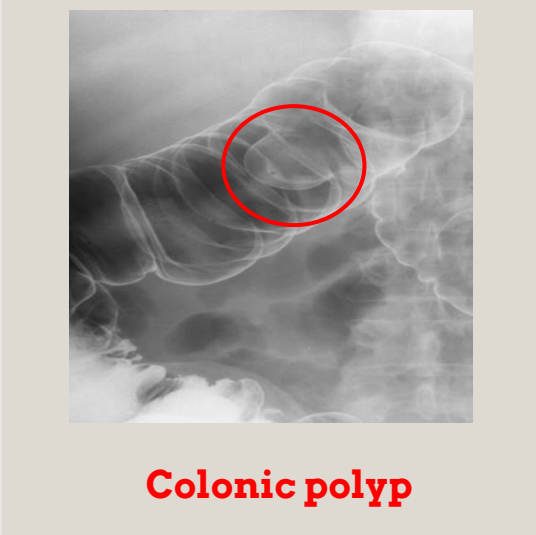
Barium enema



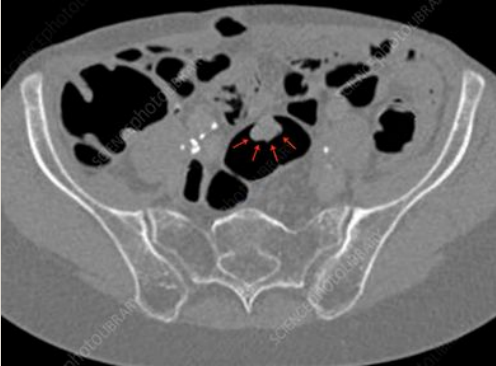
CT shows : Colonic Diverticulitis → inflammation

Colonic Polyps

Double contrast barium enema



Computed tomography



Large bowel:

Colon cancer (Apple core sign):



Stricture. Barium Enema and coronal CT showing a short, circumferential **narrowing** in the sigmoid colon (arrows) from carcinoma.

- Barium enema (left image) shows narrowing of the lumen due to presence of soft tissue mass "Apple core sign" = (narrowing + shouldering).
- We can't see the mass in the FLUOROSCOPY (**only narrowing**) BUT we can see it in the CT.

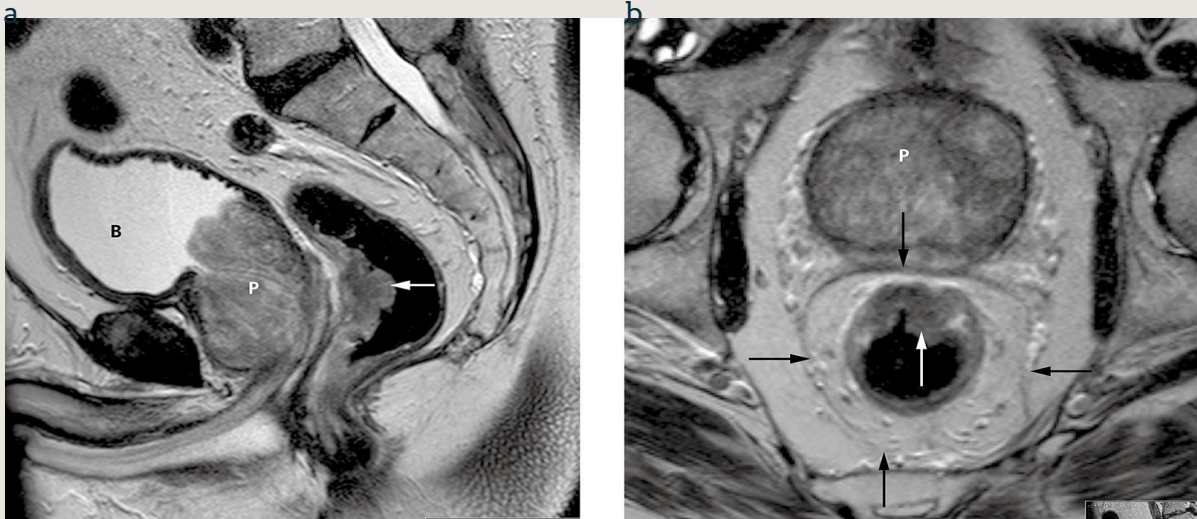


Colon carcinoma standard axial CT acquired on thin sections showing a tumor in the transverse colon. (thickened wall, tumor plugging into the lumen)

Example: 60 y/o male presents with fatigue only. He has chronic anemia, and nothing else > this suggests colon cancer. Notice the apple core appearance on fluoroscopy and the soft tissue mass in the CT scan.

Large bowel:

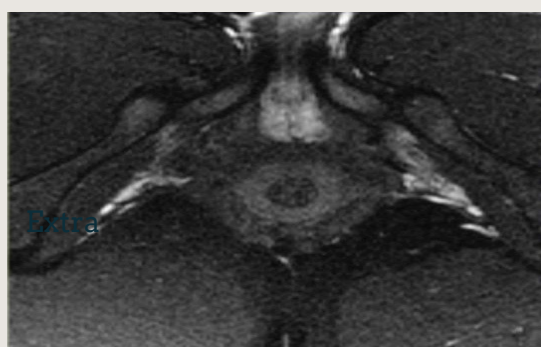
Rectal Carcinoma:



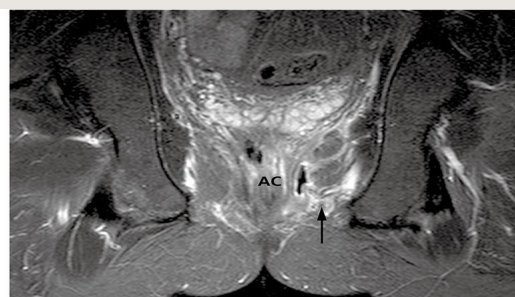
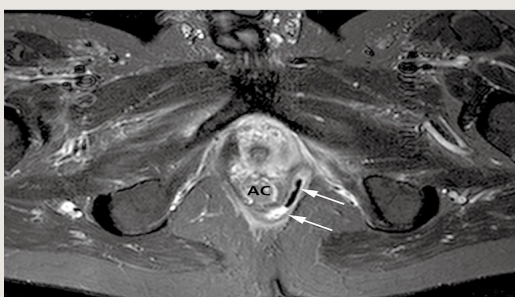
This is **MRI of Rectal Carcinoma**

- (a) Sagittal T2-weighted image demonstrating a polypoid growth (arrow) arising from the anterior wall of the rectum. Note the benign hyperplasia of the prostate (P) and a slightly trabeculated bladder (B).
 - (b) Axial image of the same tumor (white arrow). Note the mesorectal fascia (black arrows) encases the mesorectal fat and the rectum.
- Posterior wall of the rectum is normal and in the lumen there is gas.
 - **In The anterior wall there is fungating mass** (polypoid growth, A fungating lesion is a lesion that fungates, that is, becomes like a fungus in its appearance or growth rate). **And because there is fat between the mass and the prostate, the mass is not invading.**
 - **MRI is very good for rectal cancer local grading & CT for distal metastasis.**

Perianal Fistula this part is not in doctor's slides but we suggest that you study it



Normal perianal area



Perianal fistula in crohn's disease. MRI with contrast is the best in perianal disease

SUMMARY

sign	Indication
Most of Esophagus is Dilated (food residual) with smooth narrowing at the lower End (Bird beak sign).	Achalasia
Mass will clear the contrast and will appear black (filling defects)	Gastric Carcinoma
Cobblestone sign + thorns rose	Crohn's disease
Lead pipe appearance	Ulcerative colitis
White spot in the appendix	Appendicolith
Apple core sign	Colon cancer



Remember:

- Shouldering indicates overgrowth of the wall (mass).
- The difference between gastric masses and ulcer is that the ulcer will accumulate the contrast in ulcer site which will appear as dense but in case of mass, the mass will clear the contrast and will appear black.

QUESTIONS

1. Which one of the following is an aggressive feature on barium swallow:

- a) Accumulation of contrast toward certain site in the stomach.
- b) Outpouching that is filled with contrast.
- c) Visualization of mucosal layer in fundus.
- d) Area that is clear from contrast in antrum.

2. What do you see in this fluoroscopic image:

- a) Normal small bowels.
- b) Dilation of the small bowel.
- c) Thickening of the wall.
- d) Small erosion of the mucosal lining.



3. What is the name of this study::

- a) Barium meal.
- b) Follow through.
- c) Barium enema.
- d) MRI enterography.

4. What do you see:

- a) Small erosion of the mucosal lining.
- b) Narrowing of the lumen and thickening in the wall of ileocecal junction.
- c) Deep ulcers.
- d) Thickening of the wall of small bowel.



1. Which one of the following is an aggressive feature on barium swallow:

- a) Bird beak shape.
- b) Irregular narrowing throughout the esophagus.
- c) Shouldering at the upper end of the narrowing.
- d) Outpouch that is filled with contrast.

help us improve with your feedback:



RadiologyRadiology437@gmail.com



We would be happy, to hear your feedback

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References

- ✓ Slides
- ✓ 436 Teamwork

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You did it !

