

Radiological anatomy of The GIT

Lecture 10

Objectives

- To know various radiological investigations used for GIT.
- To understand step wise approach in requesting GIT radiology investigations.
- To be familiar with radiological appearance (anatomy) seen in various imaging modalities.
- To interpret plan x-ray radiograph of abdomen with common pathologies.

Color Index:

Main text Males Slides Female Slides Dr's Notes Important Golden Note Extra

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Editing File

» What is peculiar about GIT? (GIT characteristics):

- 1- Hollow viscus (Not solid)
- 2- Usually filled with gas
- 3- Motility

» Radiological Modalities :



» X-Ray (Plain Radiography)

- 1- Often used as first imaging modality.
442: (Screening purposes)
- 2- Cheap
- 3- Fast.
- 4- Can be done bedside (Portable).
- 5- Useful for free gas and bowel obstruction.
442: X-Rays can give initial assessment of the diagnosis.



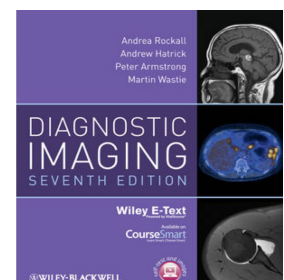
If photons attempt to pass through a high-density structure (such as bone), only a few photons will pass through, while the rest will be reflected. Conversely, when attempting to pass through a low-density structure (such as gases), most photons will pass through, resulting in the appearance of blackness.

» Fluoroscopy (Contrast Study)

- 1- Can be used as first imaging modality.
- 2- Cheap.
- 3- Use of contrast . why? To add **density** thus appreciate anatomy
- 4- Recently replaced by CT & MRI.
To avoid the radiation especially for known case of chronic disease.
- 5- Useful for **intraluminal** pathology. such as mass in the lumen or mucosal details
- 6- Can give clue about motility (function).



The reference for this lecture and the GI diseases lecture is : Diagnostic image, chapter 6



» Ultrasound

- 1- Relatively cheap.
- 2- No radiation.
- 3- Limited use in gas filled structures .such as stomach, small or large bowels. But if there is any mural mass we can detect it by US. so gas prevent us from seeing the whole anatomy.
- 4- Used in pediatrics and pregnant ladies.

Ultrasound studies have a limited role in GIT examinations because of Gas filled bowel

Indications for US is :

- Acute Abdomen
- Appendicitis for paediatric and pregnant women
- Pyloric stenosis

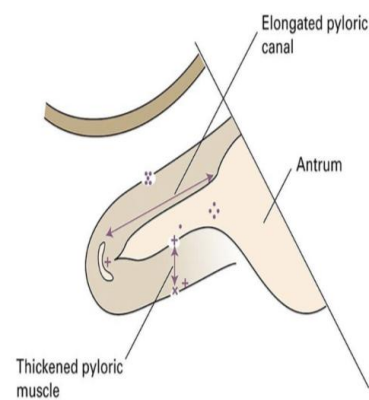


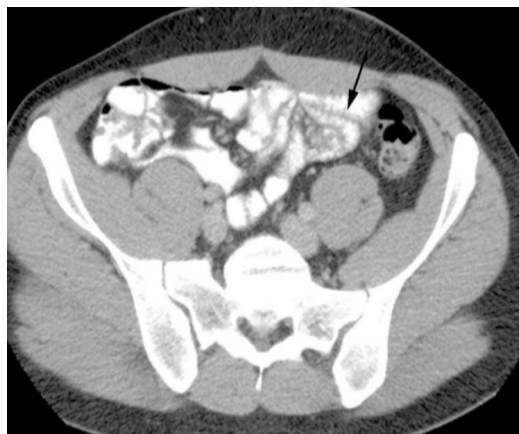
Fig. 6.29 Pyloric stenosis. Ultrasound scan in a neonate showing a thickened, elongated pyloric canal.

Pyloric stenosis. Ultrasound scan in a neonate showing a thickened, elongated pyloric canal. In babies, 4 weeks old, males with swelling in epigastric area and projectile vomiting.



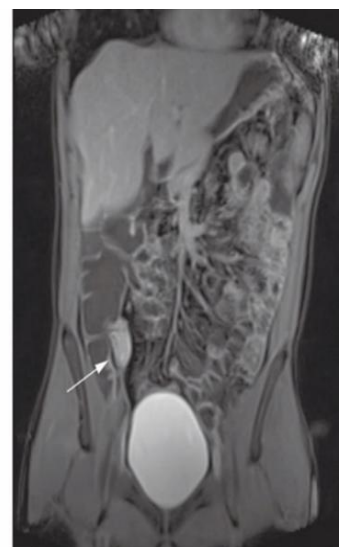
» CT

- 1- Expensive.
- 2- More radiation. (compared to x ray and fluoro)
- 3- Fast.
- 4- Contrast (IV to assess all vascular structures, Oral to assess esophagus, stomach, duodenum, small and large bowels, rectal assess the rectum and whole colon) usually used.
- 5- Used in emergency department.



» MRI

- 1- More expensive than CT.
- 2- No radiation.
- 3- Slow and affected by artifacts. either respiratory or motion artifacts, patient has to be stable
- 4- Excellent for soft tissue. Good for tissue that contain water
- 5- Can't be reformatted. Unlike the CT. We very rarely use it for emergencies.

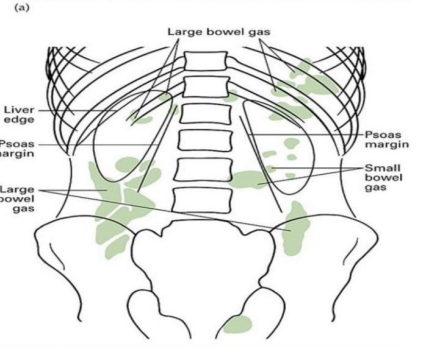
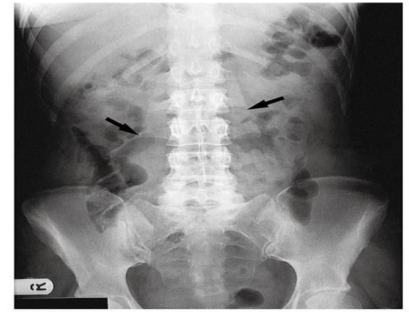


Abdominal X-ray

- 1- Stomach
- 2- Transverse Colon
- 3- Small bowel
- 4- Cecum
- 5- Descending colon

indication:

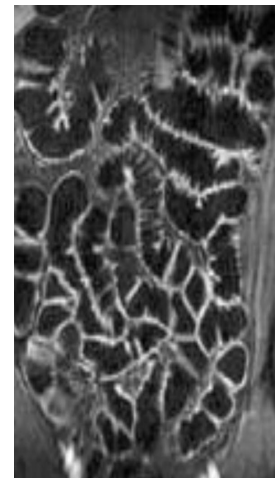
- bowel perforation
- bowel obstruction
- renal injury
- foreign body
- stones



MRI Study

MRI Enterography

Used mainly to diagnose IBD (inflammatory bowel disease)
* Assess soft tissue, bowel wall, mucosa, the activity of the disease for example crohn's disease, also it can show you bowel movement



» Barium Study

Barium Swallow

Barium Meal

Barium Follow through

Barium Enema

» Esophageal Barium Swallow

1- It is a medical imaging procedure used to examine upper GIT, which include the **esophagus** and to a lesser extent the stomach

2- The contrast used is **barium sulfate** single contrast to assess anatomy or obstruction. double contrast to assess mucosal details. The first 4 picture are for 1 patient how? This is fluoroscopy which is X Ray+contrast. You give the patient the contrast and you take multiple picture while the contrast is moving, thus in picture number 3 the contrast did not stop. It is just a picture not a movie.



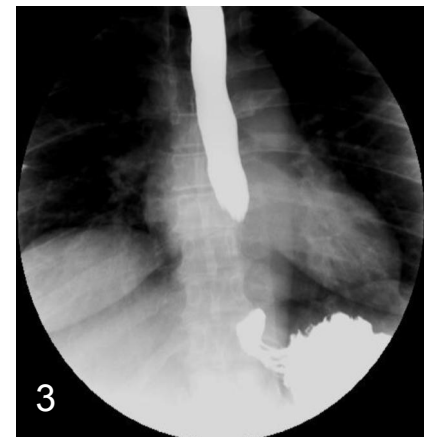
1

Esophagus starts at lower border of cricoid cartilage



2

Courses through posterior mediastinum



3

Ends at GI junction (gastroesophageal)



4

Normal impression in the Esophagus

Aortic arch, left main bronchus, left atrium

narrowings are most likely due to normal peristalsis, unless it was persistent

Very white

Less white



442:
Double contrast (contrast+gas): allows to see the lining and mucosa of GIT.

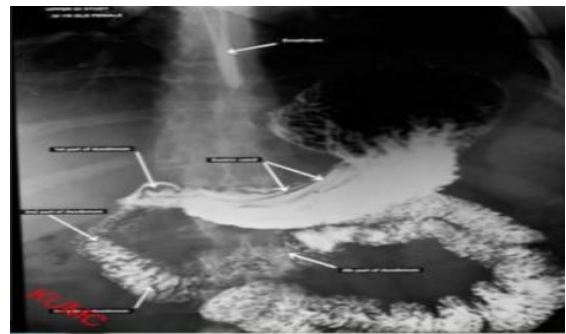
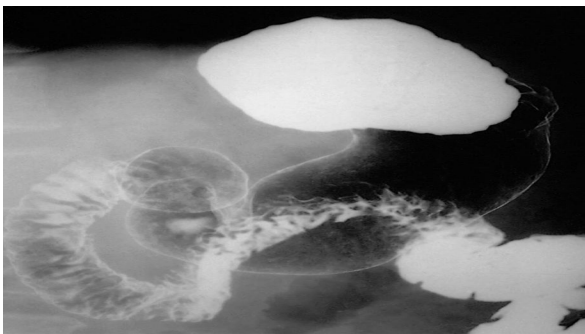
» Barium Meal

- ❖ In a barium meal test, X-ray images are taken of the **stomach** and the beginning of the **duodenum**.
- ❖ Usually it is assessed by **double contrast**
- ❖ Assess if there is any mucosal abnormality or any mass, assess the duodenum cap to see if there is any ulceration and the length

What is single and double contrast?

-Single contrast: It is the Barium alone thus one density. Good to show the lumen and if there is narrowing

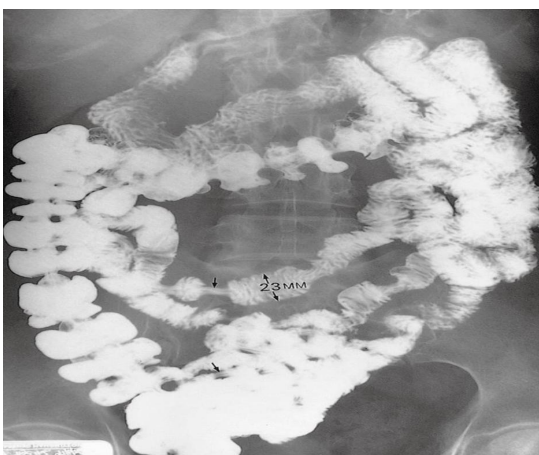
-Double contrast: Barium (called +ve contrast) + Air (called -ve contrast) thus two density. We purposely give the patient this air. Good to show the mucosal lining



Extra

» Barium follow through

- In a barium follow through, X-ray images are taken for the **small bowel loops**.
- **Pic1:** Small bowel follow through
- **Pic2:** Small bowel enema



Pic1



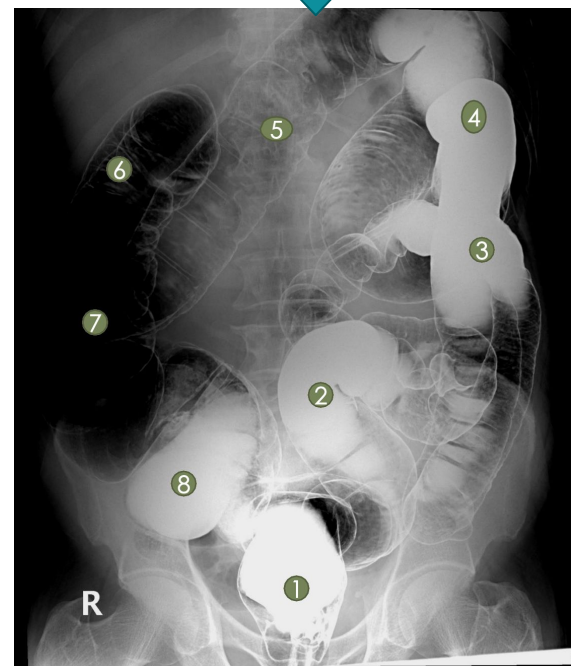
Pic2

» Barium Enema

Double contrast



- 1- Rectum
- 2- Sigmoid Colon
- 3- Descending Colon
- 4- Splenic Flexure
- 5- Transverse Colon
- 6- Hepatic Flexure
- 7- Ascending Colon
- 8- Cecum



Single contrast

-The light green line is the Haustra. This is a double contrast of the large bowel
-Haustra can be missing or diminished in the left side of the colon normally. But in right and transverse it MUST be present. Absent haustra in right or transverse is pathological.

Radiological Appearance of the GIT

» CT scan

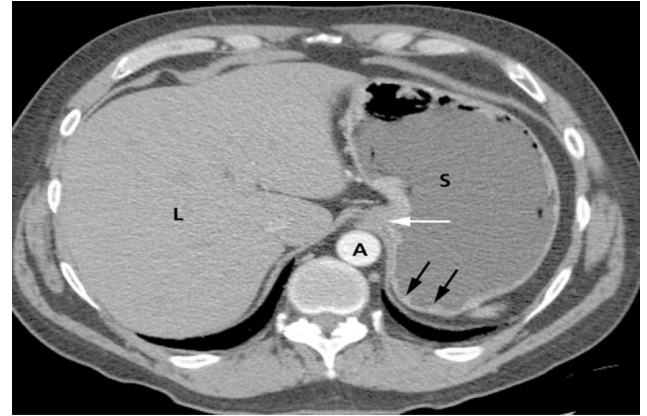
L = liver

S = stomach

A = aorta **why white in the picture?**

Due to contrast

* Assess gastroesophageal area, gastric lumen, gastric wall, abdominal aorta, and liver parenchyma

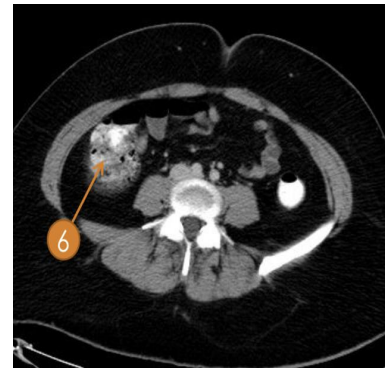
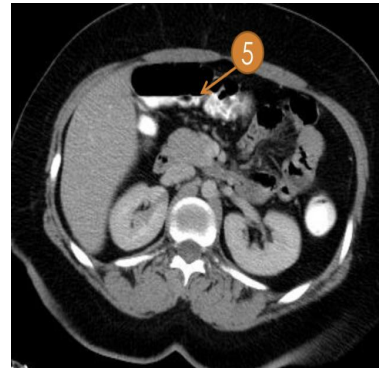
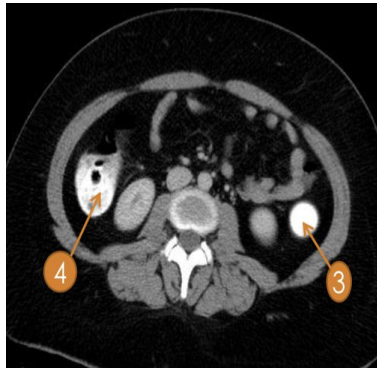


Pelvic region

Mid-Abdominal

Upper-Abdominal

Mid-Abdominal



1-Rectem

2-Sigmoid colon

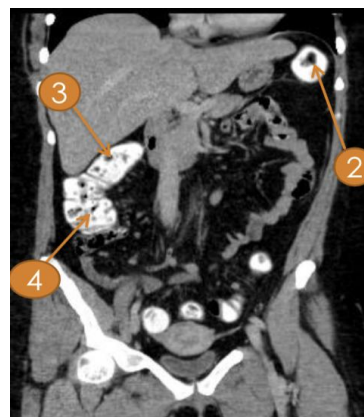
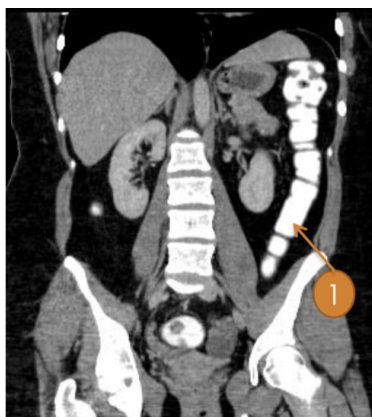
3-Descending colon

4-Ascending colon

5-Transverse colon

6-Cecum

» Coronal CT scan



1. Descending colon

2. Splenic flexure

3. Hepatic flexure

4. Ascending colon

5. Cecum

6. Sigmoid colon

Common plain X-ray abdomen radiograph finding

ABNORMAL AIR COLLECTION WITHIN ABDOMEN

Case 1

Crescentic gas shape seen under the right hemidiaphragm as well as the left hemidiaphragm (free gas)

What are the findings?

- 1- Black arrows pointing to the air bubbles.
- 2- If the air bubble was at the site of stomach **left hemidiaphragm**, it would be normal bubble (left side).
- 3- While if it was on the right side, it indicates the perforation due to peptic ulcer.
- 4- We can see normal air fluid level in the stomach and cecum

Free AIR = Pneumoperitoneum

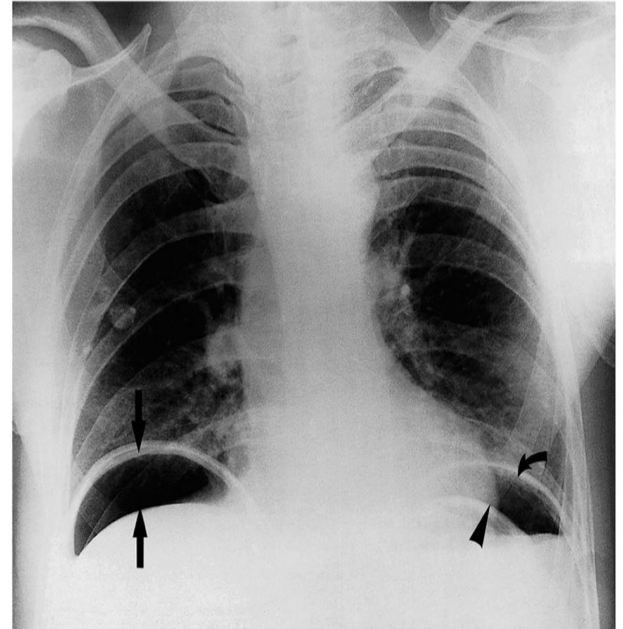


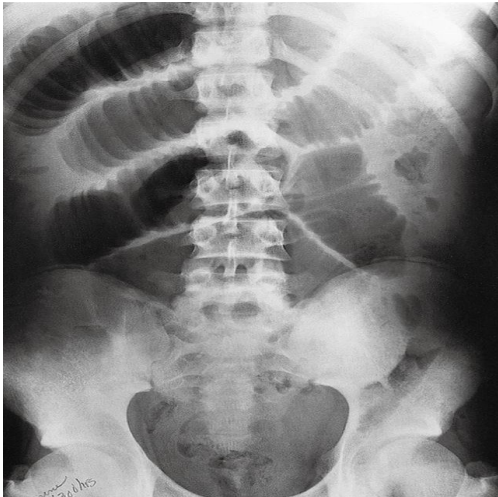
Fig. 5.7 Free gas in the peritoneal cavity. On this chest radiograph, air can be seen under the domes of both hemidiaphragms. The curved arrow points to the left hemidiaphragm and the arrow head to the wall of the stomach. The two vertical arrows point to the diaphragm and upper border of the liver.

Small bowel

DILATED SMALL BOWEL LOOPS = SMALL BOWEL OBSTRUCTION

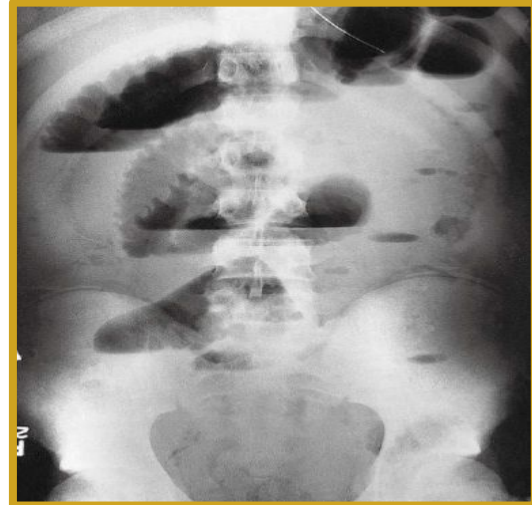
Case 2

Supine position



-Dilated small bowel loops in the center with prominent mucosal folds
-Because he is supine no air fluid levels are visible

Erect position



Multiple air fluid levels at multiple location, and dilated bowel loops. Suggestion: obstructed small bowel obstruction (colon is collapsed)

Spine position: you can see the distribution of the bowels
Erect view: you can see the air fluid level

How to differentiate small from large?

Small: located in the **center** and have **valvulae conniventes**

Large: located **peripherally** and contain **haustra**



(a)



(b)

Fig. 5.2 Small bowel obstruction due to adhesions. (a) The jejunal loops are markedly dilated and show air-fluid levels in the erect film. The jejunum is recognized by the presence of valvulae conniventes. (b) The 'stack of coins' appearance is well demonstrated in the supine film. Note the large bowel contains less gas than normal.

Large bowel

DILATED LARGE BOWEL LOOPS = LB OBSTRUCTION

Case 3

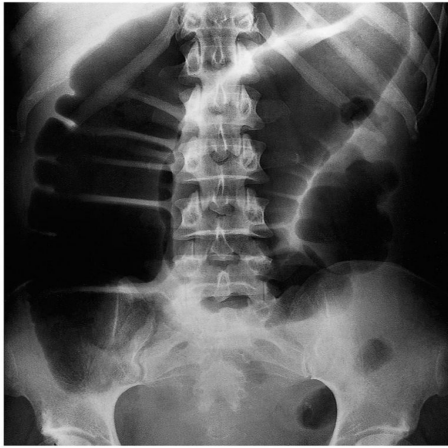


Fig. 5.3 Large bowel obstruction due to carcinoma at the splenic flexure. There is marked dilatation of the large bowel from the caecum to the splenic flexure.



Fig. 5.4 Paralytic ileus. There is considerable dilatation of the whole of the large bowel extending well down into the pelvis. Small bowel dilatation is also seen.

dilated large bowel located peripherally
(you can see haustra which does not cross the whole length of the bowel).

DISPLACED BOWEL LOOPS = SOFT TISSUE MASS LESION

Case 4

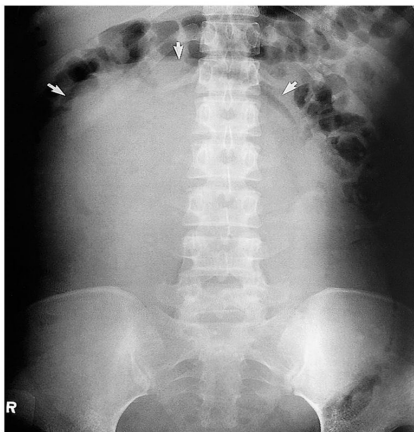


Fig. 5.19 Mass arising out of the pelvis (arrows) displacing bowel to the sides of the abdomen. The mass was a large cystadenocarcinoma of the ovary.

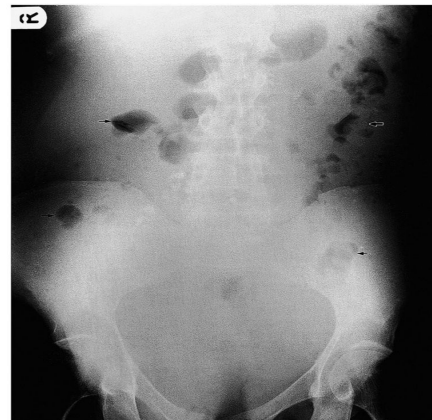


Fig. 5.11 Ascites. Note how the gas in the ascending and descending colon (arrows) is displaced by the fluid away from the side walls of the abdomen.

- Little gas can be seen in both pictures.
 - in the left pic we have a gas that is continuous, Seen in abdominal mass cases.
 - In the right picture we see displaced air in multiple sides that is indicative for ascites.
 - Ascites displace gas in multiple area unlike an obstructing abdominal mass.
 - in left pic, With x-ray we can't tell if it is fluid or soft tissue
- Soft tissue lesion (bc it is gray in color) it can be cystic or solid, projecting from the pelvis to the abdomen
- So it is a large pelvic-abdominal mass causing displacement of the adjacent bowel
- Will be evaluated properly using another modalities such as CT or US

Examples of calcified lesions in the abdomen

Case 5

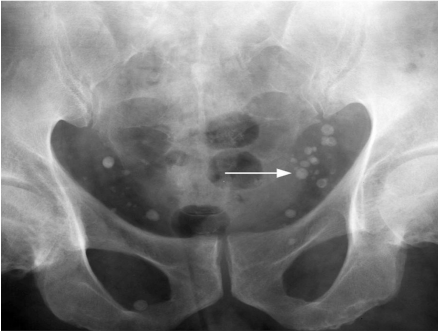


Fig. 5.12 Calcified phleboliths in the pelvis. The arrow points to one of the phleboliths.

(phlebolithes)

- Density in the pelvis with hollow core
- rounded calcification with lucent center in both side of the pelvis. Usually it is vascular calcification called phlebolithes



Calcification uterine fibroid

- large well defined calcification in addition to the phleboliths in the pelvis.



Chronic pancreatitis calcification

- viscus calcification seen along the normal anatomy of the pancreatic parenchyma. So chronic pancreatitis + chronic calcification

(Mesenteric Mass which get calcified)

- calcified lesion located peripherally in the center of the abdomen, it obscured the psoas shadow
- Will be evaluated properly by CT or US

442:

- In some cases it might indicates abdominal Aortic aneurysm.
- Known as Eggshell calcification.

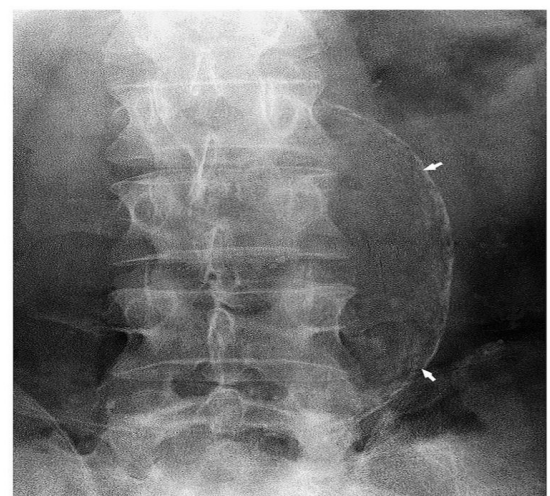
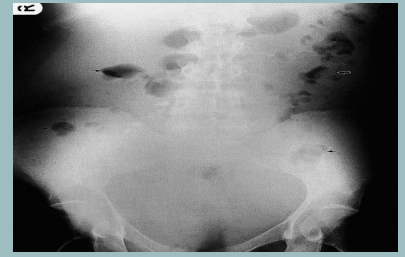


Fig. 5.14 Calcified abdominal aortic aneurysm (arrows). The aneurysm measured 8cm in diameter on the lateral view.

1- 44 years old male presented with distended abdomen since 3 months , fatigue , leg swelling and yellowish eye discoloration, what is the most likely diagnosis ?

- a. Ascites
- b. Bowel obstruction
- c. Abdominal calcification
- d. Paralytic ileus



2- What is the finding in this CT scan?

- a. Small bowel obstruction
- b. Large Bowel obstruction
- c. Bowel perforation
- d. Appendicitis



3- A 79-year old male came to the ER complaining of abdominal pain and severe constipation. What's the diagnosis based on the x-ray below?

- a. Small bowel obstruction
- b. Large Bowel obstruction
- c. Bowel perforation
- d. Appendicitis



4- Which of the following modalities is used to assess the esophagus motility , transit time, and any obstruction or strictures?

- a. Barium swallow
- b. Barium enema
- c. Barium follow through
- d. Barium meal

5- :Which of the following represent the radiological study?

- a. Barium follow through
- b. Barium meal
- c. Small bowel enema
- d. Large bowel enema



Answers
1) A
2) A
3) B
4) A
5) A

Special thanks for 38 & 39 teams