MED437
King Saud University

RADIOLOGY 437 TEAM

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Editting File

# Interactive Lecture (3)

## Gastrointestinal & Hepatobiliary Imaging


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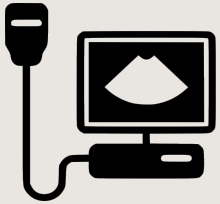
# Name five radiological modalities

X-Ray

Fluoroscopy

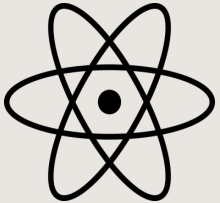


Ultrasound

MRI

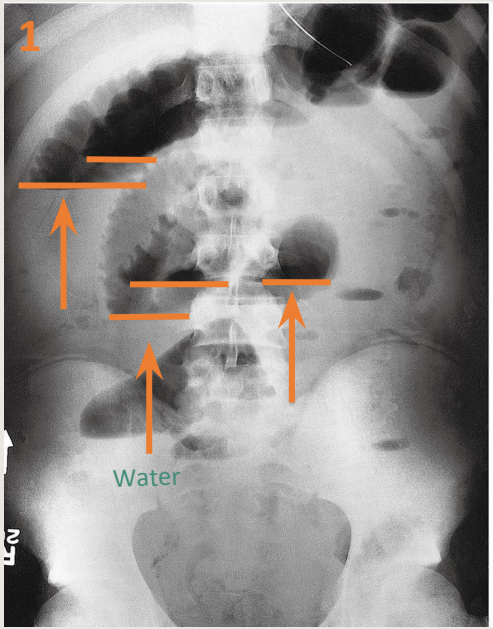
CT scan

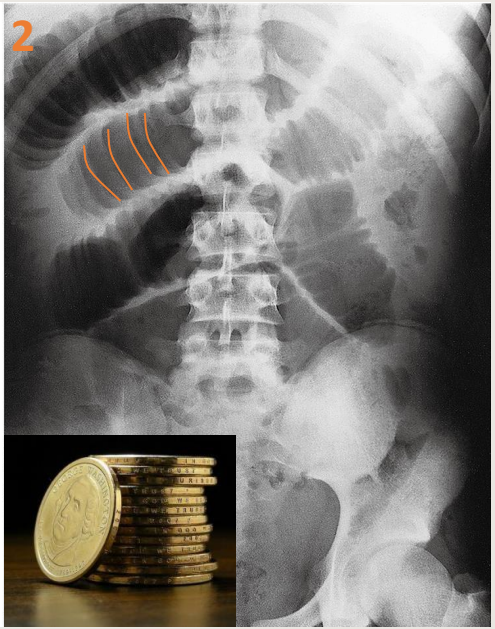
Angiography



Nuclear medicine

# Case 1




- **What is the modality?**
  Plain abdominal X-RAYS.
  No contrast unlike fluoroscopy.

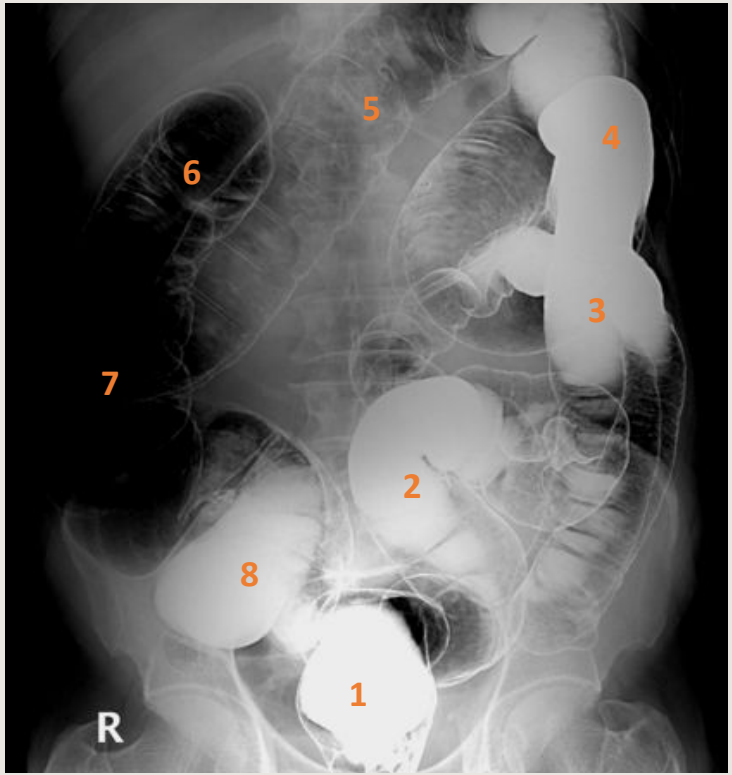
- **Mention 2 abnormalities?**
  **Picture 1:** Multiple air-Fluid levels. **Picture 2:** Stack of coins signs.

- **What is the diagnosis?**
  Mechanical bowel obstruction, it also can be associated with ileus, ischaemia and gastroenteritis.

Notes

- **Image1:** Erect film, in case of multiple air fluid level, it's a sign of obstruction due to adhesions, and there is increased diameter of small bowel (dilation), (normal jejunum is 1.5 - 2.cm, normal ilum is 2 - 2.5).
- **Image2:** Supine film, dilatation and thickened wall, stack of coins sign indicate thickening of small bowel convinces "inflammation of the wall". It can happen with bowel obstruction.
- Large bowels contains less gas then normal.

# Case 2




- **What is the name of the study?**

Air double contrast barium enema.

- **Name the labelled structures?**

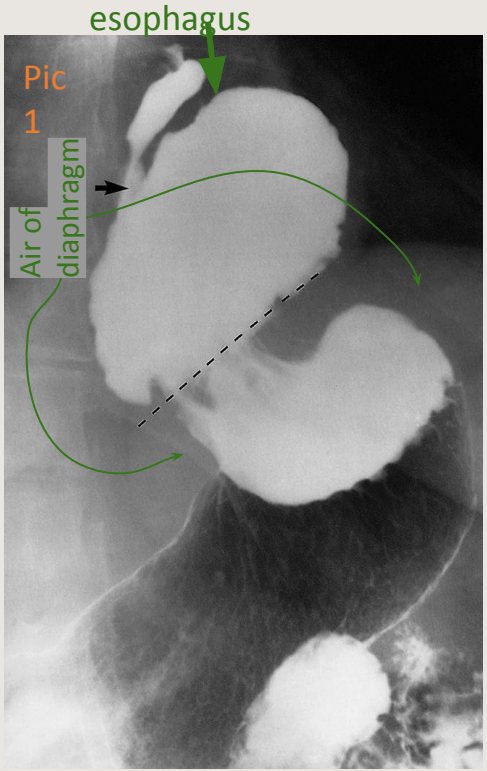
1. Rectum.
2. Sigmoid colon.
3. Descending colon.
4. Splenic flexure.
5. Transverse colon.
6. Hepatic flexure.
7. Ascending colon.
8. Cecum.

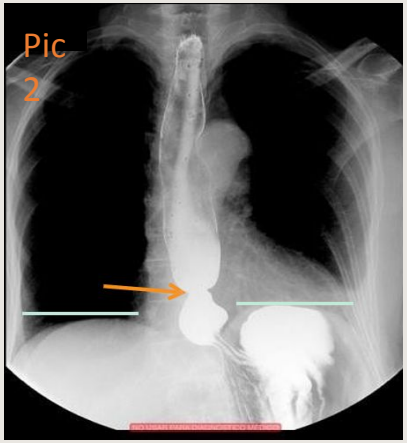
Notes

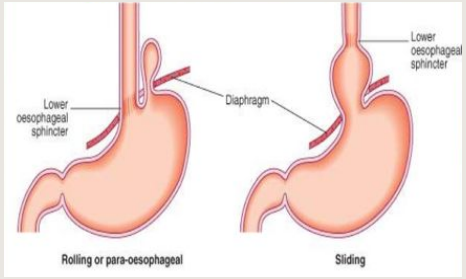
**Barium enema has two types:**

- Single contrast barium enema (No air).
- Double contrast barium enema (Air & barium) If you see clear bowel wall with gas it's double as in this image, it gives better idea about any mucosal abnormality (ulceration, lesion. etc..).
- Normally we shouldn't see ileocecal valve or terminal ileum in barium enema of a normal patient.

# Case 3




**Types of hiatus hernia**

- **What is the modality?**
  Fluoroscopy (Barium meal).
- **What is the diagnosis?**
  Hiatus hernia.

The lower esophageal sphincter normally will be on **the line with diaphragm**
But here it's not, so it's **sliding** hernia (as the green lines in pic2 represents the normal level of the hemidiaphragms).

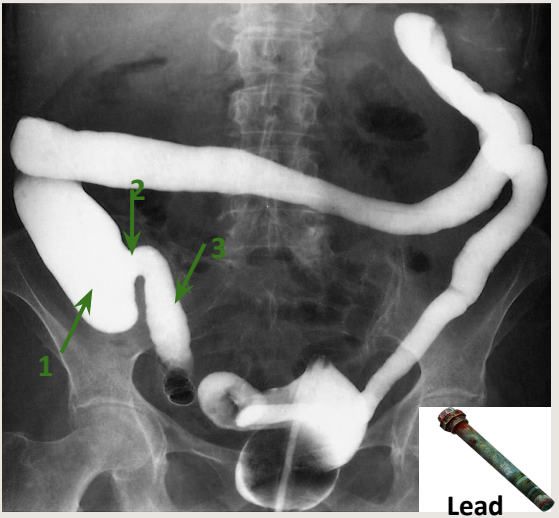
**Notes**

Hiatus hernia: we see the fundus pulled up above the level of the diaphragm.
**We have 2 types:**

- **sliding** type → abnormal location of lower esophageal sphincter or gastroesophageal junction.
- paraesophageal or **rolling** type → normal location but the stomach is herniated through another opening or through the same opening but besides the gastroesophageal junction (lower esophageal sphincter).

So, the main difference is the location of the lower esophageal sphincter.

# Case 4






Lead pipe

1. Cecum.
2. Incompetent ileocecal valve.
3. Terminal ileum.


Another example of lead pipe colon (**featureless colon**)

- **What is the modality?**
  Single contrast Fluoroscopy (Barium enema
  We don't see the mucosa here).
  Single because we don't see the wall of bowel nor gases.

- **What is the name of the sign?**
  Lead pipe sign.
  **Loss of bowel haustra sign** الخطوط السوداء, it's important because ulcerative colitis predispose to colon cancer.
  Also reflux of contrast into the ileum through an incompetent ileocaecal valve has occurred.

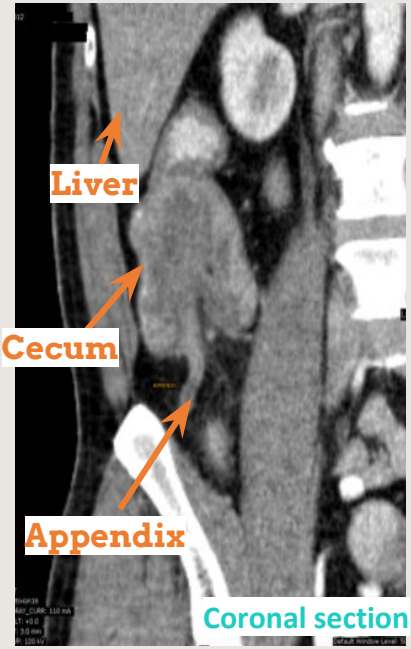
- **What is the diagnosis?**
  IBD – Ulcerative colitis (Mainly).

Notes

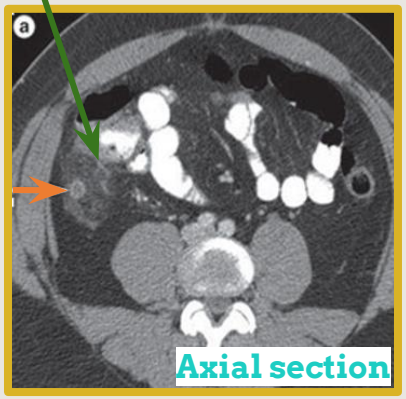
- **Normally:** Haustra can usually be recognized in the whole colon, although they may be absent in the descending and sigmoid regions.

# Case 5

(Hyper-attenuated fat = Edema = inflammation = diameter > 6mm) surrounding means there's inflammation, like here in peri-appendix fat.




Normal appendix





Abnormal appendix

- **What is the name of the study?**

**CT scan.**

- **What is structure labeled on the image (a)?**

**Appendix** (retrocecal appendix).
**Is it normal or abnormal?** Abnormal, because the diameter is enlarged, inflamed appendix (**Hyper-attenuated** means high density which is a sign of inflammation) you can compare it with the color of subcutaneous fat or any other fat and you will know that it is hyper attenuated.

- **What is the diagnosis of the patient on image a?**

**Simple appendicitis.**
(no complications such as abscess, perforation or air in peritoneum).

- **What is the gold standard imaging modality for such diagnosis? And what is the alternative image modality in pregnant/pediatric patients?**

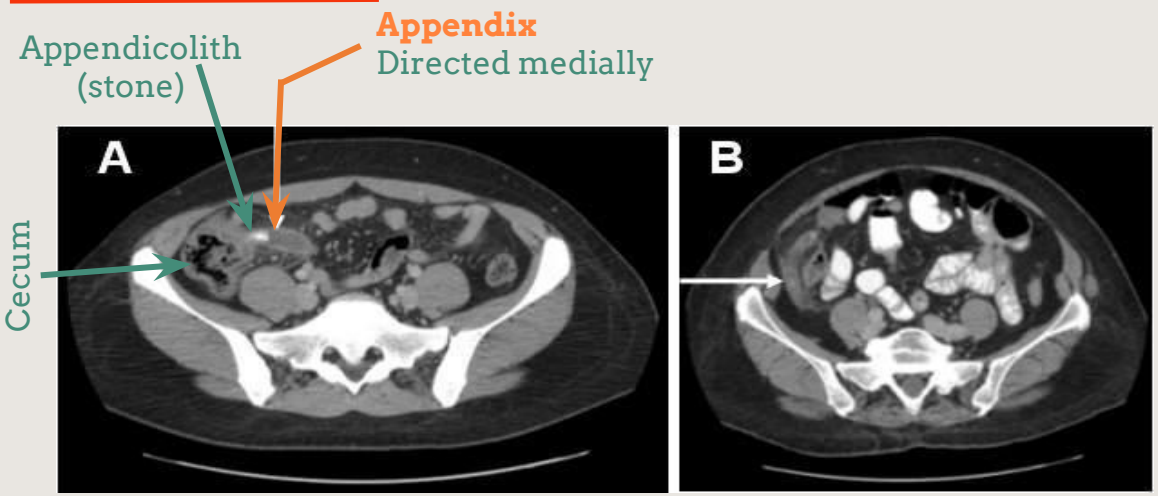
**CT scan** + contrast **is the gold standard, U/S is the alternative** for pediatric & pregnant.

Notes

**Signs of appendicitis:**

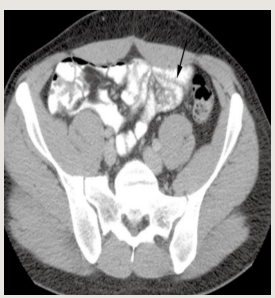
- Dilated diameter (normal diameter of appendix is 0.6 cm or 6 mm).
- Hyper-attenuation (or stranding) of periappendicular fat.
- Enhancing of wall (thick wall).

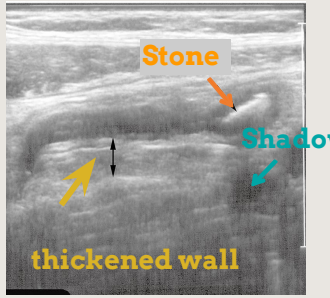
# Case 5




- CT scan. Iliac bone → this section in the pelvis.
- Stone of appendix (**appendicolith**) impacted in the base of appendix → obstruction of lymphatic drainage → inflammation.
- Not all appendicitis because of stones.

- Ascending colon (white arrow).
- Cecum (RLQ) → there is something protruded either it's terminal ileum (if reach to small bowel) or appendix (blind ended).






- Appendix normally is **compressible** by US probe but here the wall is rigid so the the appendix as whole will get lower when pushed with the probe (not compressible = abnormal = appendicitis).
- Normally, there will be no **appendicolith** (lith=stone, in appendix).
- Appendix should not exceed **6mm** in diameter..
- This is **appendicolith.**
- A double-headed arrow again indicates thickening of the appendix wall.
- On CT Scan the surrounding fat should be **clear**.

# Case 6

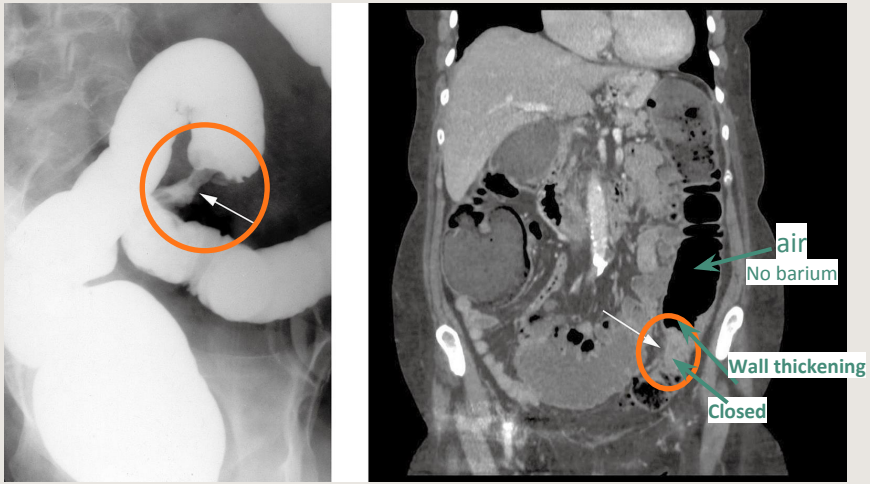
- **What is the name of the study?**
  Double contrast Barium enema.
- **What is the pertinent sign?**
  Apple-core sign.
- **What is the diagnosis?**
  Colon cancer, 100% until proven otherwise.

**Notes**

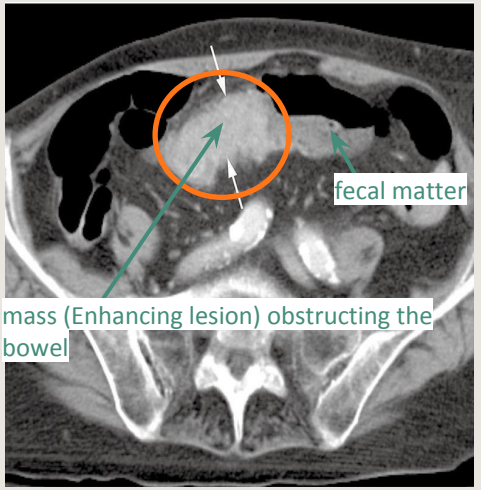
- **Neoplastic strictures** have shouldered edges, an irregular lumen and are rarely more than 6 cm in length.
- **Benign strictures** classically have tapered ends, a relatively smooth outline and may be of any length.

# Case 6

## Examples of colon cancer in barium enema and CT scan

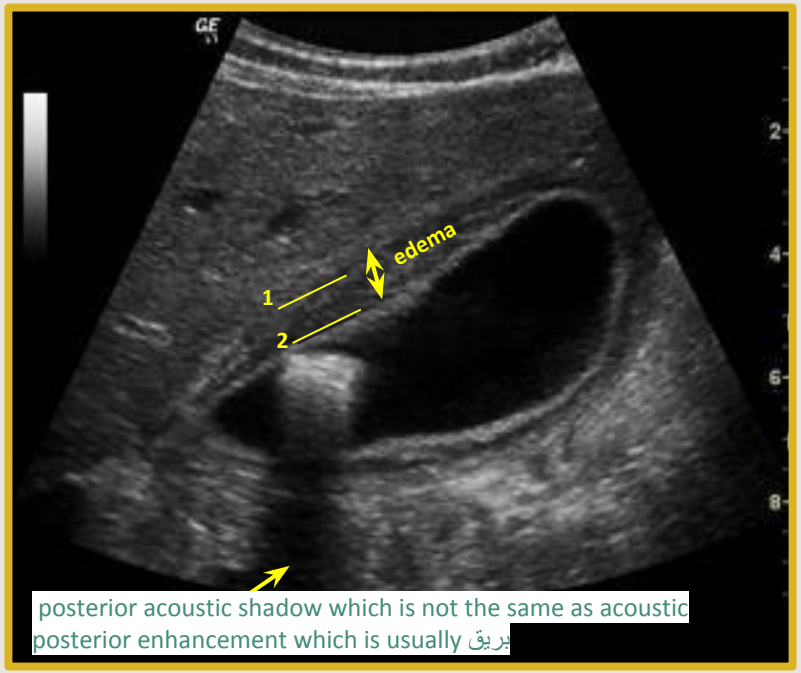



Stricture. (**a**) Barium enema represents apple core sign (malignant) and (**b**) coronal CT showing a short, circumferential narrowing which started with wall thickening and then obstruction in the sigmoid colon (arrows) from a tumor.




Standard axial CT acquired on thin sections showing a tumor (arrows) in the transverse colon.

# Case 7




1. Outer wall of the gallbladder.
2. Inner wall of the gallbladder.

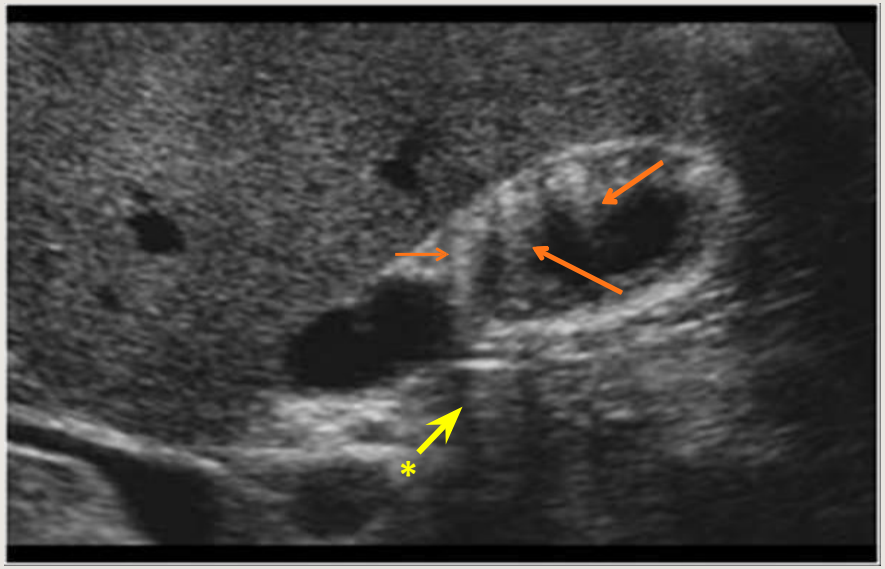
- **What is the name of the modality?**
  Ultrasound.
- **What is the diagnosis?**
  Gallstone with cholecystitis (or called calcular cholecystitis).
- **What are the expected symptoms the patient has?**
  RUQ pain radiating to right shoulder aggravating by fatty meal.
- **Treatment?**

Surgery (cholecystectomy) but wait for the inflammation to subside first.

## Notes

- We have hyperechoic lesion and acoustic shadow (BLACK) so **we know if it is cholecystitis if there is thickening of the wall** secondary to edema "Calculus cholecystitis".
- **The presence of an acoustic shadow is an important diagnostic feature for confirming stones.**
- Acoustic shadowing is not seen with polyps.

# Case 8




* This is normal area and not hypoechoic and didn't represents acoustic shadows!! it appears hypodense because it separates two enhancements.

- **What is the name of the modality?**
Ultrasound.

- **What is the findings?**
Hyperechoic lesions within the wall.

- **What is the diagnosis?**
Gallbladder adenomyomatosis (fat + muscle in wall of gallbladder).

- **What is the important of this disease?**
Misdiagnose with stone, benign lesion and can convert to malignant lesions, F/U follow up is needed.
Posterior acoustic **enhancement** = fat (arrows), unlike stones which give shadows (enhancement → white / shadow → dark)

**Notes**

- This tumor consist of fat and muscle which will cause thickening of the wall of gallbladder.
- This tumor associated with formation of intramural diverticula or sinus tracts termed **Rokitansky-Aschoff sinuses.**

# Case 9


- **What is the modality?**
  Ultrasound.
- **What is the findings?**
  Shrink, irregular nodular surface, hyperechoic texture (in fatty liver and liver cirrhosis), ascites.
- **What is the diagnosis?**
  Liver cirrhosis.

# case 10


- What is the modality?

U/S of the liver.

- What is the findings?

Hyperechoic focal hepatic nodule, solitary and single, wall distended.

- What is the diagnosis?

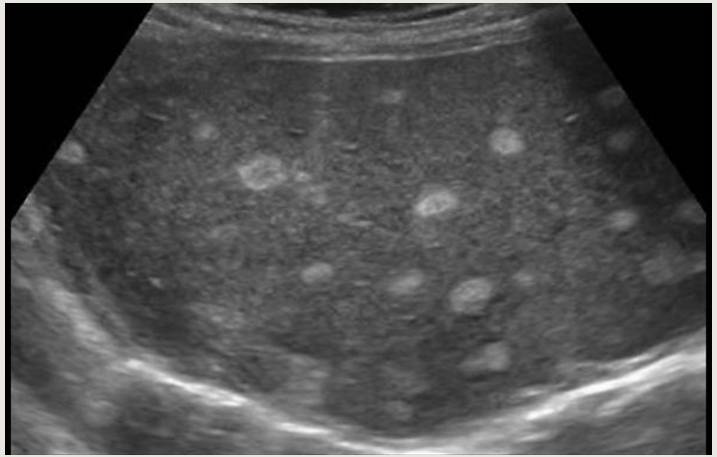
Hemangioma.

- What is other imaging modality to confirm the diagnosis?

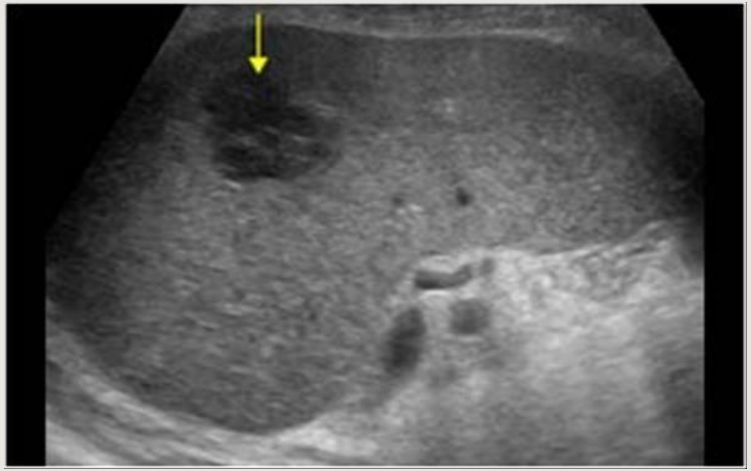
- Triphasic liver CT scan.
- MRI.

- Most of Hyper-echoic solitary nodules which are well defined are hemangioma which is benign.

# case 11



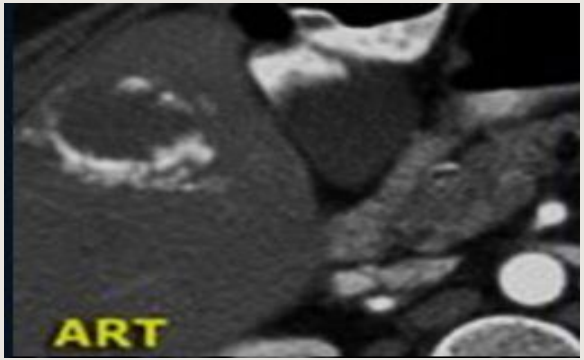
**Hyperechoic lesions** Metastatic or HCC
Multiple lesions with varying size > metastatic



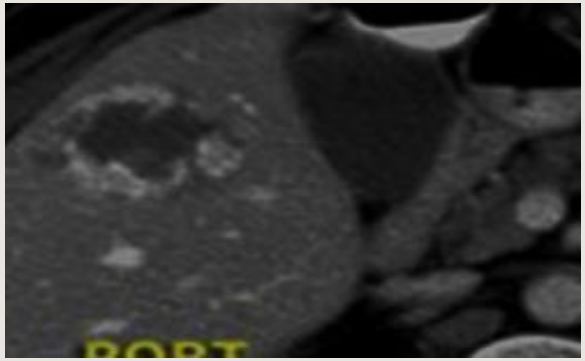
**a Hypoechoic lesions**
Most of hypoechoic mass are malignant = metastasis or HCC.
This is not a cyst! the cyst will be very black

- Scanning during the arterial phase, about 30 seconds after the injection of contrast, will show lesions such as **Hepatocellular carcinoma.**
- Haemangiomas are typically well-defined, peripheral, echogenic masses at ultrasound. “Incidental”.

# case 11




**Arterial phase:**
Peripheral nodular enhancement
**How to know its the arterial phase?** look at the aorta.



**Portal venous phase:**

- Fill in enhancement (centripetal enhancement) the contrast tries to go in.
- In arterial phase there is **peripheral nodular enhancement** there will be wash in the venous phase.
- Finally there will be **homogenous enhancement** in **delayed phase** this represent **"Typical Hemangioma".**


**Delayed or Equilibrium phase:**
Homogenous enhancement
كأني مسحتها بمسّاحة

These are all signs of **hemangioma** → benign
**don't touch lesion** (don't biopsy) leave it alone.

# case 12




**Arterial Phase:**
Homogenous enhancement

**Portal venous Phase:**
Isodense (we can't see it anymore)

**Delayed or Equilibrium phase:**
Hypodense (Washout)

- What is the modality?

Triphasic liver CT scan.

- What are the findings?

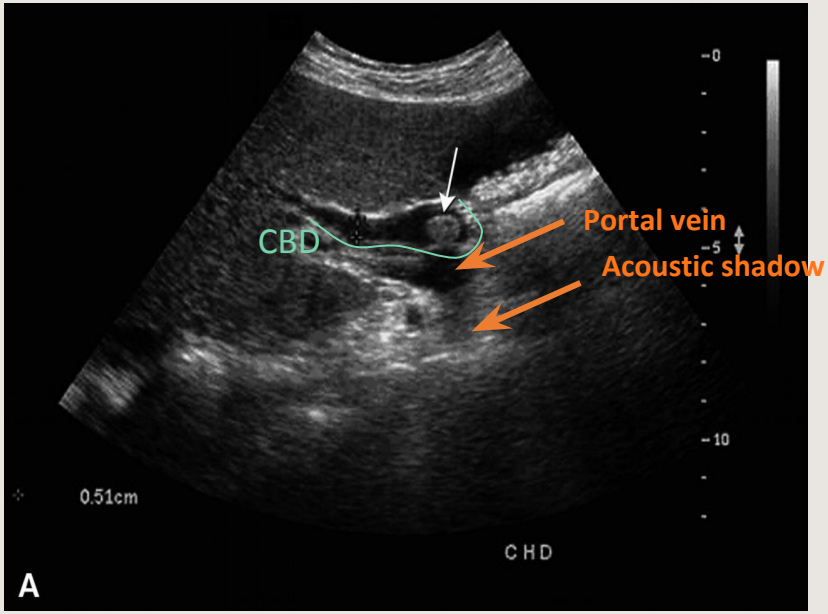
Focal hepatic lesion with fill-in enhancement.

- What is the diagnosis?

HCC or metastatic.

- In the **arterial phase** there is early enhancement then there will be iso-enhancement in the **venous phase (same as the surrounding tissue).**
- And the **late phase** it will be washout of the contrast and this represent **hepatocellular carcinoma or metastasis.**
- Nodular surface, shrunken liver, enlarged caudate lobe → HCC.

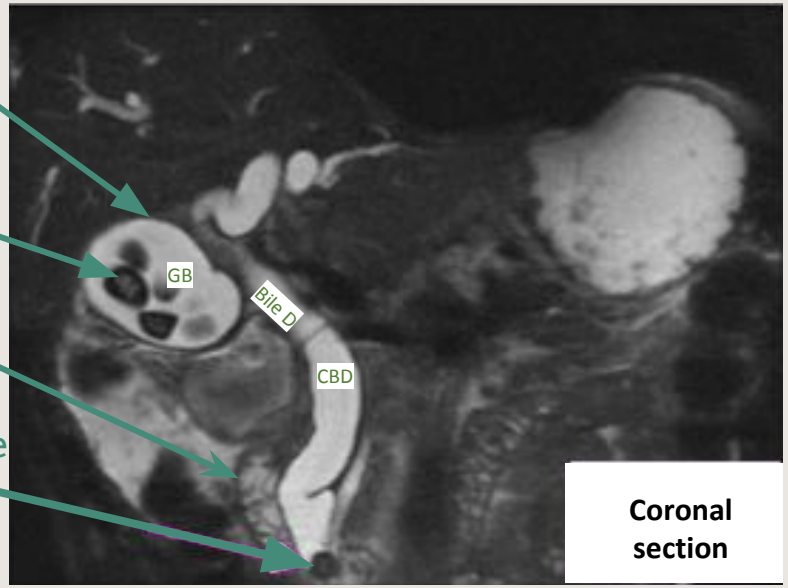
# case 13




- What is the modality?
  U/S.
- What is the findings?
  Hyperechoic lesion (stone) in CBD (common bile duct).
- What is the diagnosis?
  CBD stone (white arrow) → obstructive jaundice.
- What is the expected symptoms and signs the patient has?
  Yellow discoloration, RUQ pain, Hyperbilirubinemia and dark urine.

Normal diameter of CBD is 4mm but in the pic 0.51cm.
So, CBD is dilated.

# case 14

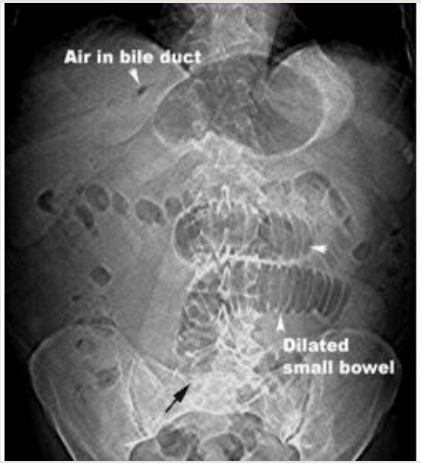



**Stone in …**

1) Proximal CBD → **PTC** (diagnostic & therapeutic) to drain bile to prevent infection due to stagnation.
2) Distal CBD → obstruction of ampulla of vater > **ERCP** and do myomectomy.

- MRCP = MRI Cholangio-Pancreatico-graphy (imaging of the bile ducts with the pancreas).
- The dark signals in the gallbladder is stone, impacted in distal CBD and dilatation of the bile ducts.
- Fluids (water, bile, urine) appear white in MRI while black structures are dense materials.

# case 15

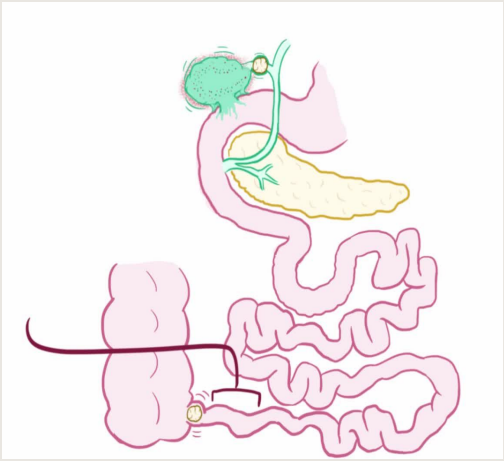




Triad of Gallstone ileus*:

1. Air in the bile ducts, Pneumobilia.
2. Dilatation of the small bowel (stacked coins).
3. Calcified stone in the distal bowel. Not clear in Pic 1 , clear in CT Pic 2.

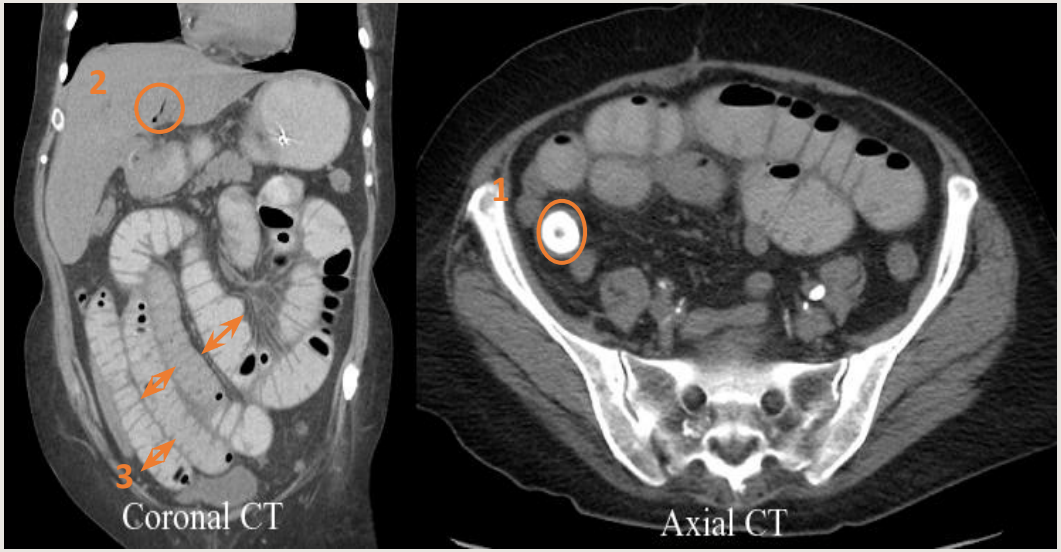
- Diagnosis by Radiology.
- Treatment by Surgery.



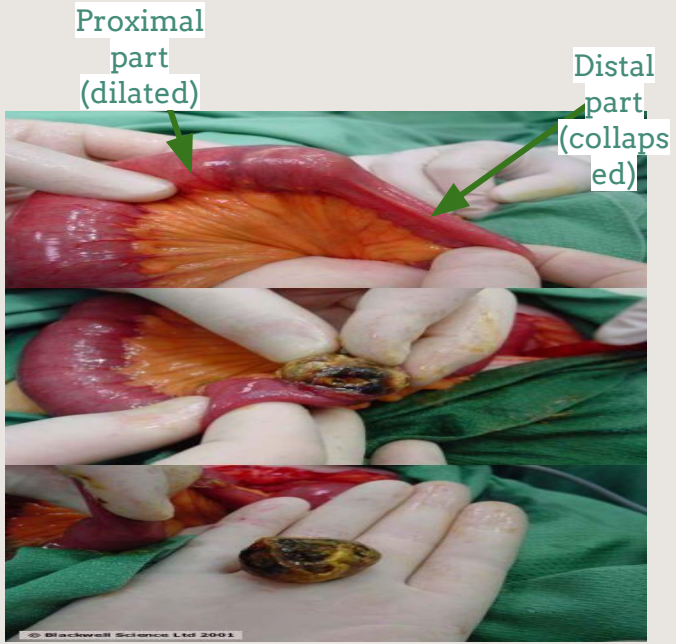
*gallstone ileus → obstruction of small bowel due to gallstone.

- Rare disease, happens when there is chronic inflammation which causes adhesions to form between the gallbladder and the duodenum.
- After time fistula will form and then stones may pass through this fistula and pass until it reaches the narrowest part of the duodenum (ileocecal valve) and obstruct it.
- Air enters the gallbladder so we have air inside the bile duct.

# case 15




1. Gallstones in terminal ileum. 2. Air in biliary tract.
3. Distended small bowel loops.




Terminal ileum stone → surgery (they cut proximally to the stone and remove it).

This CT demonstrates the classic Rigler's Triad of gallstone ileus: Pneumobilia (air in the biliary tract), low small bowel obstruction with distended small bowel loops, and an impacted gallstone in the terminal ileum. Gallstone ileus is the name given to the mechanical small bowel obstruction caused by a gallstone impacting in the terminal ileum. The gallstone passes through a cholecystoduodenal fistula, travels the length of the small bowel, and then obstructs just proximal to the ileocecal valve. It is an unusual complication of cholecystolithiasis and chronic cholecystitis.

# Extra

This is ERCP shows large filling defect of gallbladder which is large gallstone and we can see the contrast around the stone (white arrows) the gallbladder causes compression and dilatation of the common hepatic or common bile ducts by indirect obstruction (from outside) it is called “Mirizzi's syndrome”.

# Team members

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Faisal Altahan

Abdullah balobaid

Saad Alhadab

Moath Abdulghani

Faisal Alrayes

**This is it!** we are done with 1st semester.
We would like thank **team 436** and each member of our team for the time and effort they put in.
Thanks to all students who gave us feedback.
We hope we came in handy for our batch.

**Radiology437 team leaders.**

## Help us improve with your feedback:

RadiologyRadiology437@gmail.com

**We would be happy, to hear your feedback**

**click Here !**

## References


✓ Slides
✓ 436 Teamwork