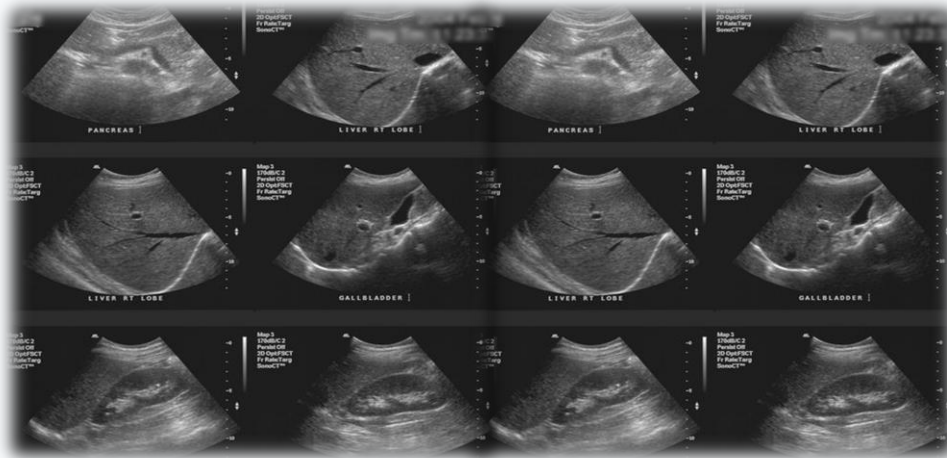




Gastrointestinal tract Block



Radiology of the abdomen

Lecture -1-

Objectives

- To know radiology modalities used in abdomen imaging mainly GI tract.
- To know advantages and disadvantages of each modality.
- To know indications and contraindications of each modality.
- Overview on normal abdomen appearance and common pathologies including:
 - i. Pneumoperitomium.
 - ii. Peptic ulcer.
 - iii. Bowel obstruction.
 - iv. Inflammatory bowel disease.
 - v. Large bowel masses/malignancies.

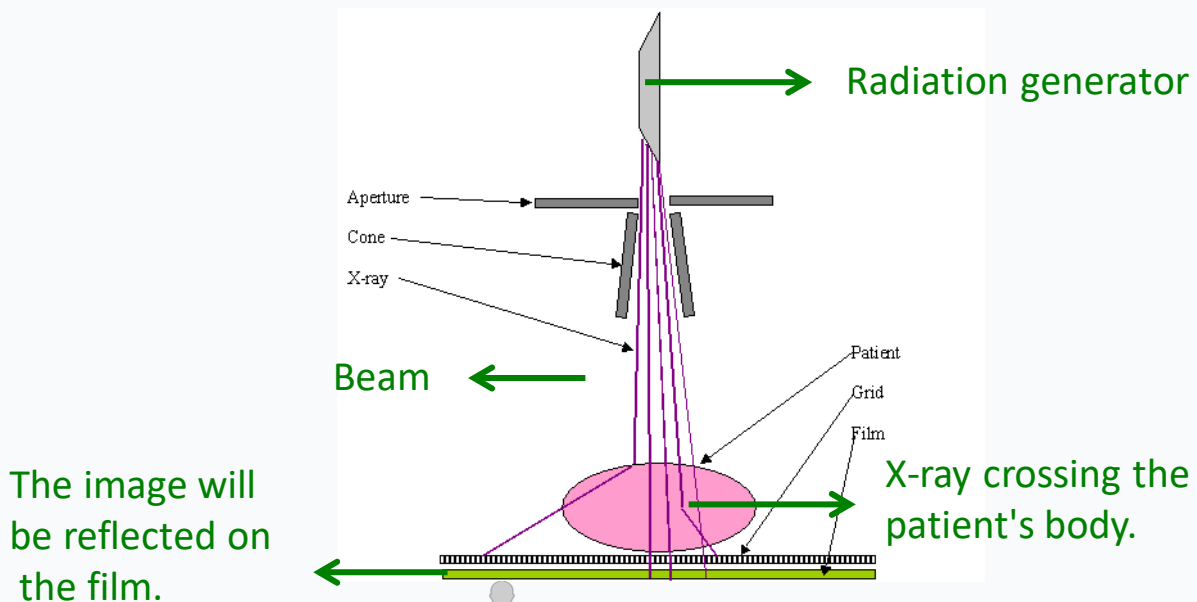


What radiological modalities are GOOD in imaging the abdomen mainly the STOMACH and BOWEL LOOPS?

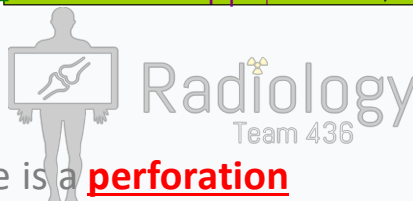
- X-ray
- Fluoroscopy
- CT scan (CT is ideal for diagnosis)
- MRI
- ~~US~~ (ultrasound imaging is limited by bone- and gas filled structures, and usually used to assess liver, gall bladder and urinary bladder). So it is NOT used to assess bowels.

X-Ray (Abdominal X-ray) First step

- X-ray is a form of radiation, that are focused into a beam
- X-ray can pass through most objects including the human body.
- When X-rays strike a piece of photographic film, they make a picture.



The image will be reflected on the film.



Important:

- Free air means there is a perforation
- Multiple air fluid levels means obstruction

Abdominal x-ray (continue)

- White: bone and calcification
- Grey: soft tissue
- Black: air

Advantages	Disadvantages
Widely available fast	Radiation
Cheap and not time consuming	Poor soft tissue details
Excellent in diagnosing free air in the abdomen ex: pneumoperitonium	
Good in diagnosing bowel obstruction & stones/calcifications	

Indications

- Abdominal pain.
- Bowel obstruction*.
- Stones **better by CT.**
- Masses.
- Trauma.
- Others, foreign body (**swallowed coin**), supportive lines (**nasogastric tube**).. Etc.

Contraindications

Pregnancy is contraindicated in all radiological modalities except ultrasound and MRI.



Radiology

Team 426

*In patient history the patient will be presented with pain, cramps and constipation for more than 3 days.

Normal abdominal X-ray*



Right side

Left side



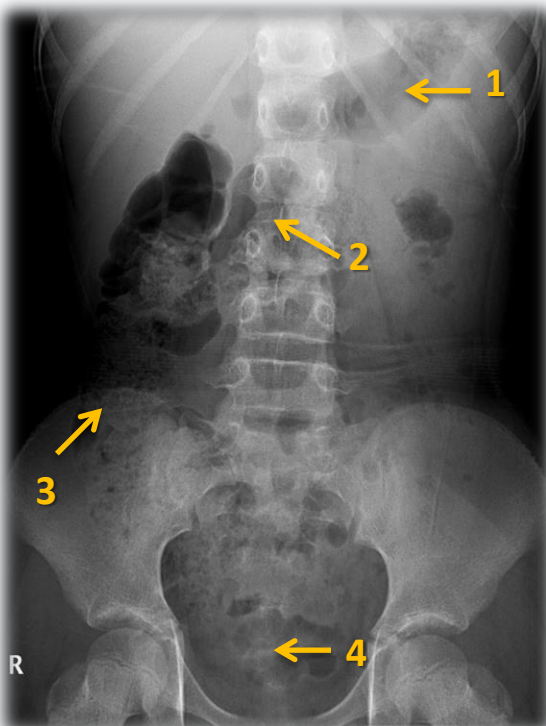
Standing

Right side

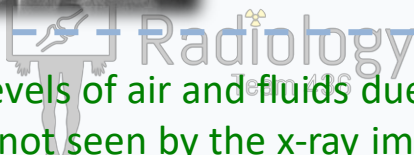
Left side



Supine

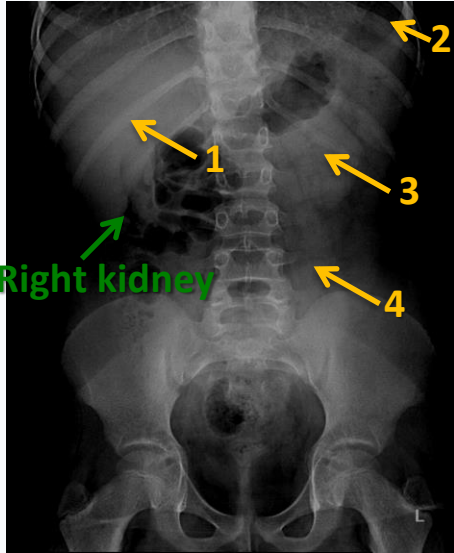


- 1- Stomach.
- 2- Small bowel.
- 3- Large bowel.
- 4- Rectum (it's important to have air in rectum, if not it means there is an obstruction).

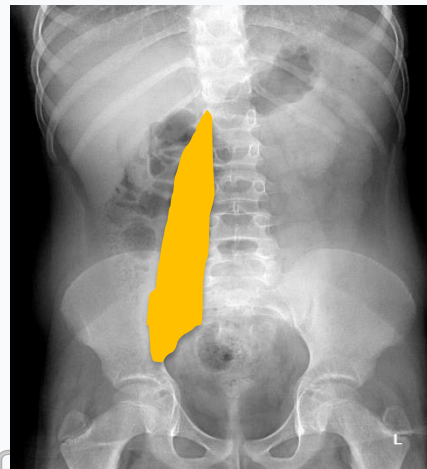
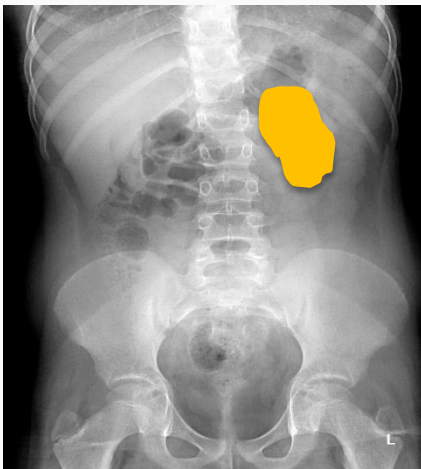
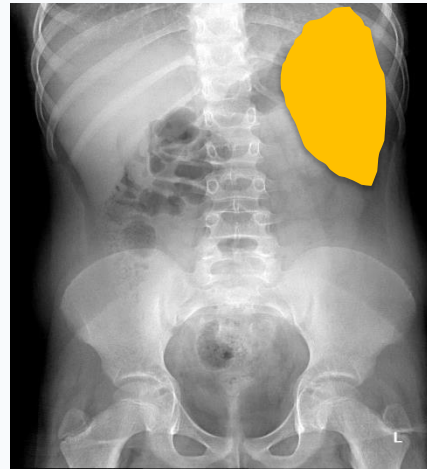
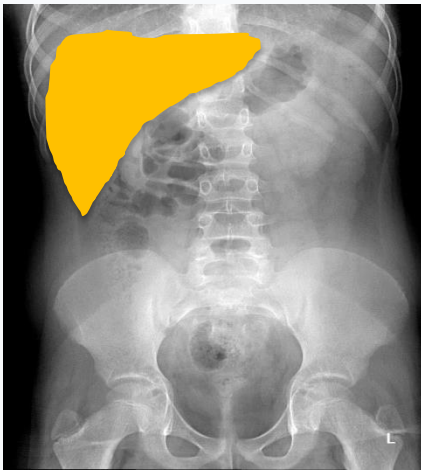


* Notice the different levels of air and fluids due the gravity. Usually the pancreas is not seen by the x-ray image except if we have calcifications.

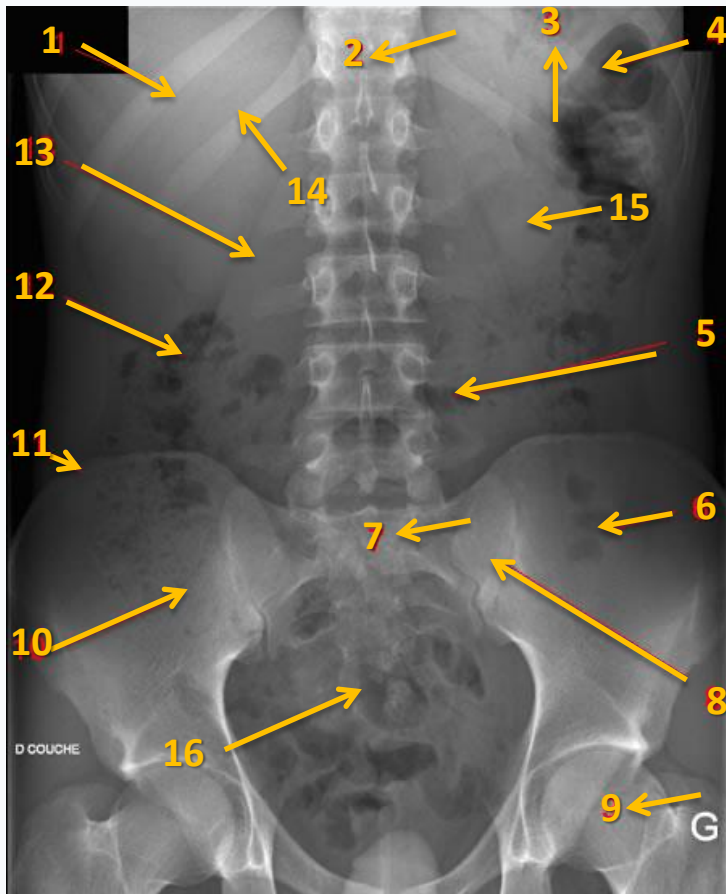
Soft tissues:



- 1- Liver.
- 2- Spleen.
- 3- Kidneys.
- 4- Psoas muscles.



Normal X-ray:



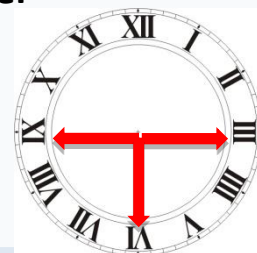
1. 11th rib.
2. T12 vertebra.
3. Gas in stomach.
4. Splenic flexure.
5. Transvers colon.
6. Gas in sigmoid.
7. Sacrum.
8. SI (sacroiliac) joint.
9. Femoral head.
10. Gas in caecum.
11. Illiac crest.
12. Hepatic flexure.
13. Psoas margin.
14. Liver.
15. Left kidney.
16. Bladder shadow.

What is normal?

- **Stomach:** Almost always air in stomach*.
- **Small bowel:** Usually small amount of air in 2 or 3 loops.
- **Large bowel:** Almost always air in rectum and sigmoid colon, and varying amount of gas in rest of large bowel.

3, 6, 9 Rule Maximum Normal Diameter of bowel

Small bowel	3cm
Large bowel	6cm
Caecum	9cm



* Absence of air indicates a problem. Team 436

In bowel obstruction: the loop preceding the obstruction is dilated, while the loop after the obstruction is narrowed.

Abnormal X-ray:

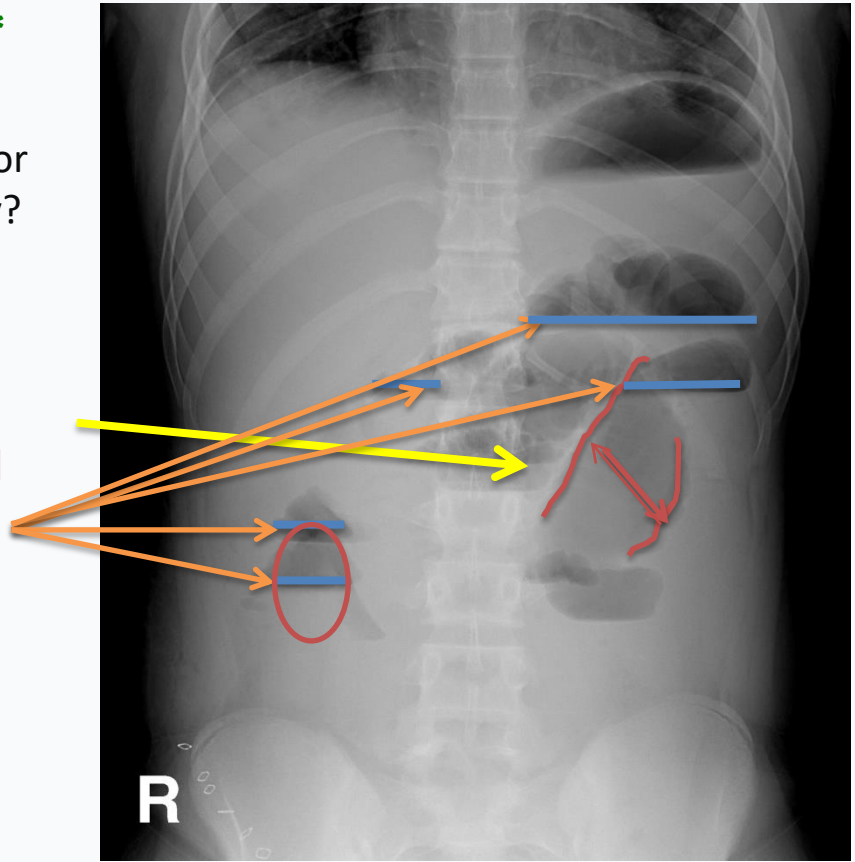
Bowel Obstruction*

Is this x ray normal or abnormal? And why?

1- Dilated bowel loops.

2- Multiple air fluid levels.

3- No air in rectum



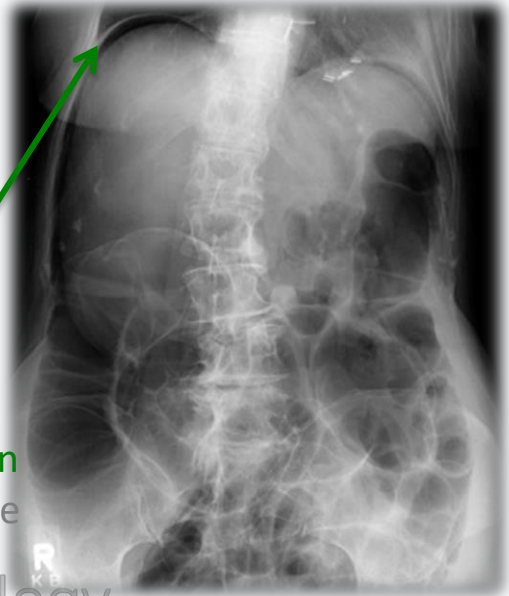
Is the air inside or outside the bowel loops? **

It is **outside** (pneumoperitonium)

Pneumo = air

Peritonium = in the abdomen

Free air indicates perforation (the black area above the diaphragm)



*To find the cause, we have to use CT or other modality.

** Notice that when we say free air we mean pneumoperitonium, while multiple air levels is for obstruction.

Fluoroscopy



X-ray

+



Oral contrast*

Uses of Barium

- Barium swallow → Esophagus
- Barium meal → Stomach
- Barium follow through** → Small bowel
- Barium enema*** → Large bowel

Advantages	Disadvantages
Available	Radiation (x2 dose)****
Relatively cheap	Poor in evaluating extra luminal pathologies (outside the GIT)
Excellent in evaluation the bowel lumen and mucosa	



Radiology

Team 426

*This what shows us the difference from the normal x-ray.

** The longest.

*** حقنة شرجية

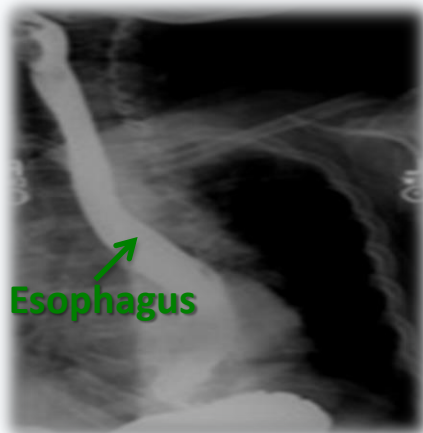
**** Double radiation: the radiation from x-ray waves & contrast media.

Indications

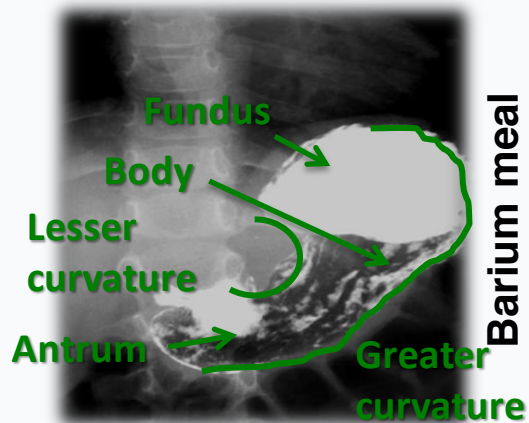
- Assessing the mucosal outline.
- Abdominal pain.
- Gastro esophageal reflux.
- Masses.
- Inflammatory bowel diseases. (Auto-immune disorder)
- Post surgical, leak.

Contraindications

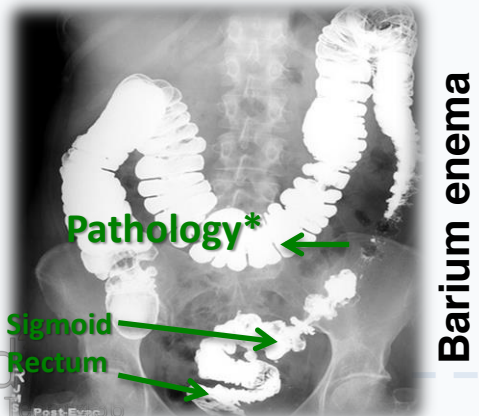
- Pregnancy.
- Bowel obstruction.
- Bowel perforation (with barium type of contrast). Barium is fat soluble so it may lead to inflammation of the peritoneum (peritonitis), water soluble substances can be used instead.



Barium swallow



Barium follow through



Barium enema

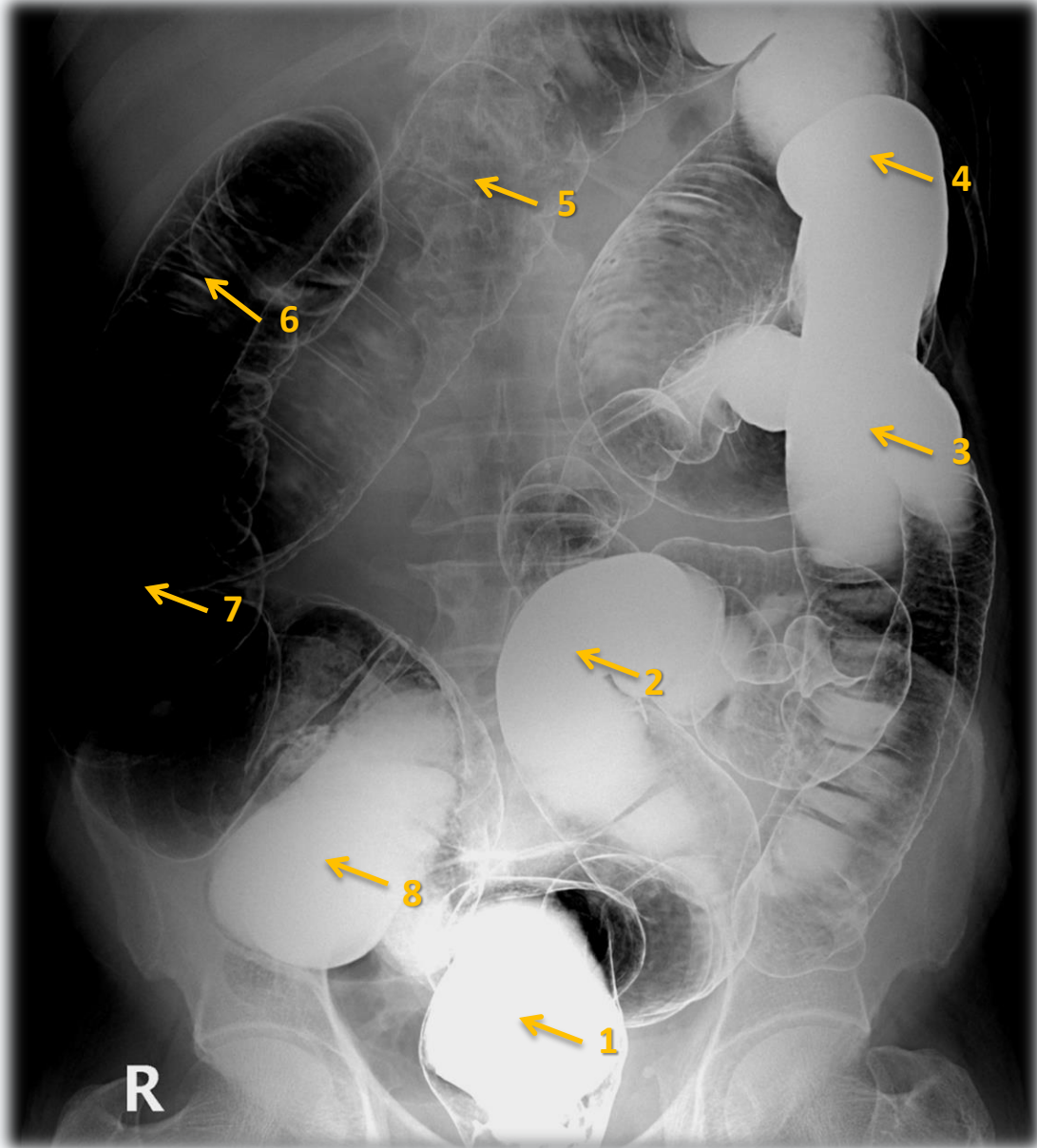
*Normally the contrast will be shown throughout the whole colon.

-Single contrast: evaluate any filling defect within bowel .

-Double contrast: gives us dilates of mucosa .

Radiograph of the abdomen:

Double contrast study*



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

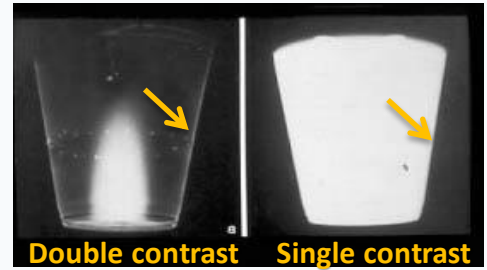
*Presence of air and fluid.



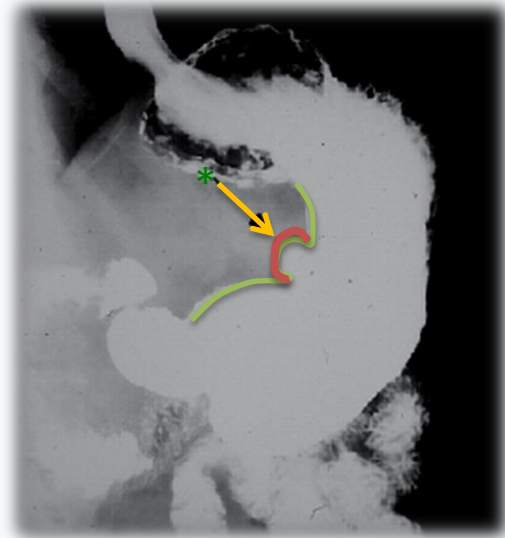
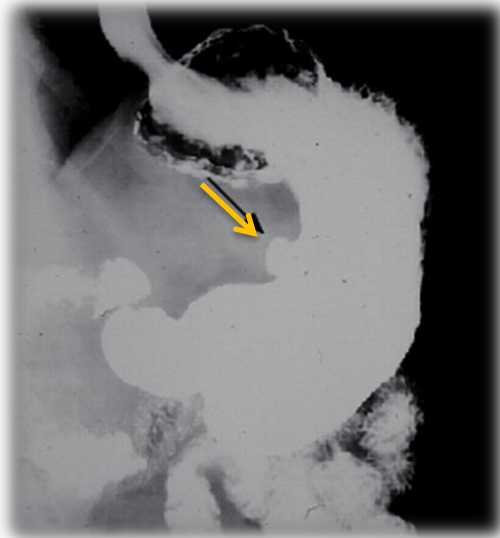
Radiology
Team 436

What is double Contrast Barium Enema (DCBE)? EXTRA

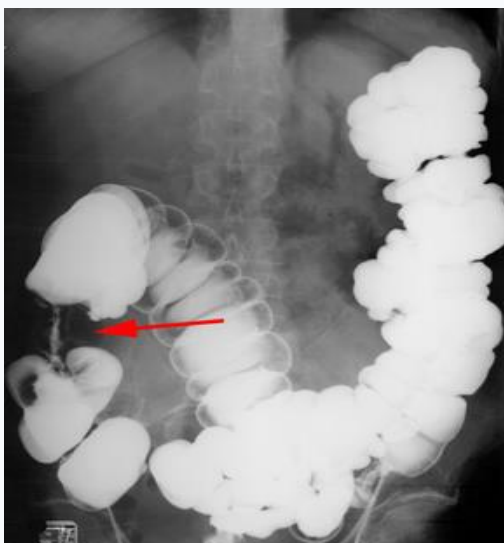
Barium is inserted into the colon and then drained out, with only a thin layer of it remaining on the colon wall then filled with air to expand it and provide more details.



Peptic ulcer Disease



Apple core sign (Colon cancer): Abnormal study (Performed by Barium enema)



*Projection from the lesser curvature of the stomach.



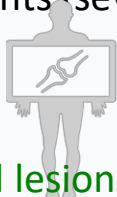
Advantages	Disadvantages
Available	Radiation
Short scan time	Some times need intra venous contrast (contraindicated with renal disease)
Much more soft tissue and bone details	
Excellent in diagnosing extra-luminal lesions	Relatively expensive
Excellent in diagnosing the cause of bowel obstruction	

Indications

- Abdominal pain.
- To look for bowel obstruction cause .
- To diagnose intra-abdominal masses .
- Trauma.

Contraindications

- Pregnancy.
- No IV contrast in renal failure.
- Unstable patients (severe trauma/ICU).



If we want to assess:

- **extra + intra** luminal lesions we use **CT**
- **intra** luminal lesions we use **fluoroscopy**

Images with barium follow through



CT with oral contrast
(more clear)



Fluoroscopy
(X-ray + contrast)

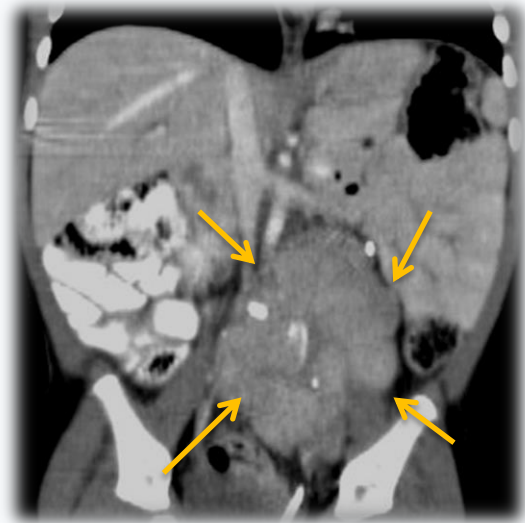


CT with oral contrast
(more clear)

Where is this mass ? Inside or outside the bowel loops?

It is **outside*** the bowel and causing mass effect.

If the lesion was inside (intraluminal) so it will not push the bowel.



Radiology

Team 426

* Outside because it is pushing the whole bowel to the other side.

MRI

Advantages	Disadvantages
Relatively safe in pregnancy (no radiation)	Expensive
Give much more soft tissue details	Long scanning time
Excellent in diagnosing abdominal solid organ lesion: liver, spleen, kidneys.	Sensitive to motion

Indications

- Abdominal **solid** organ masses.
- Inflammatory bowel disease.

Contraindications

- uncooperative patients. Moves a lot (Like children)*
- Early pregnancy (relative contraindication). In the first trimester the noise of MRI may cause hearing loss in the embryo because it is the time of forming cochlea in inner ear, so usually it is used in very urgent situations only.
- No IV contrast in renal failure (relative contraindication).



Notice the details are clear



CT scan



MRI

Can you identify what is abnormal ?

**Inflammatory
bowel disease**

Bowel wall
thickening



 Radiology

We have 2 types of IBD: 1- Ulcerative colitis. 2- Crohn's disease.

Ulcerative colitis: Lesion occurs in large bowel except colon.

Crohn's disease: Skipped lesions, any part of GI usually iliucecal junction.

Summary

	X RAY	Fluoroscopy	CT scan	MRI
Advantages	<ul style="list-style-type: none"> - Available. - Cheap. 	<ul style="list-style-type: none"> - Available. - Relatively cheap. 	<ul style="list-style-type: none"> - Available. - Short scan time. - More soft tissue and bone details. 	<ul style="list-style-type: none"> - Safe in pregnancy (no radiation). - More soft tissue details.
Disadvantages	<ul style="list-style-type: none"> - Radiation. - Poor soft tissue details. 	<ul style="list-style-type: none"> - x2 Radiation. - Poor in evaluating extra luminal pathologies. 	<ul style="list-style-type: none"> - Radiation. - Some times need intravenous contrast (renal disease). - Relatively expensive. 	<ul style="list-style-type: none"> - Expensive. - Long scanning time. - Sensitive to motion.
Indications	<ul style="list-style-type: none"> - Diagnose obstruction (without the cause). - Free air fluid levels. 	<ul style="list-style-type: none"> - Intra-luminal lesions only such as: <ul style="list-style-type: none"> a- Colon cancer (apple core sign). b- Peptic ulcer. 	<ul style="list-style-type: none"> - Identify the cause of obstruction. - Extra luminal and intra luminal lesions. - Mass. 	<ul style="list-style-type: none"> - Inflammatory bowel disease.
Contraindications	<ul style="list-style-type: none"> - Pregnancy. 	<ul style="list-style-type: none"> - Pregnancy. - Bowel obstruction. - Bowel perforation (with barium type of contrast). 	<ul style="list-style-type: none"> - Unstable patients (severe trauma/ICU). - Pregnancy. - No IV contrast in renal failure. 	<ul style="list-style-type: none"> - Uncooperative patients. - Early pregnancy. - No IV contrast in renal failure.

Uses of Barium

Barium swallow → Esophagus
 Barium meal → Stomach
 Barium follow through** → Small bowel
 Barium enema*** → Large bowel

Special thanks for
 our friends: Elham
 Alobaid & Rana
 Barasain for sharing
 us their summaries¹⁶
 =)

Thank you for checking our team =)!

Group Leaders

Hanin Bashaikh

Mohammed Alduayj

Group Members

Ghaida Alsaeed

Najd Altheeb


Abdullah Hashem

Rayan ALQarni

References

Males' and females' slides.

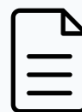
Contact us

 @Radiology436

 Radiology436@gmail.com



Feedback!



Editing file



Test yourself