

GIT /Lecture - 1

Radiological Anatomy and Investigation of GIT

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Radiological anatomy of GIT

Esophagus

Stomach : fundus , body, antrum, LCS, GCS

Duodenum

Small intestine : jejunum a LUQ, ileum at RLQ

Colon: cecum, appendix, AC DC, SC, rectum

Studies that can be done include

Plain radiograph of abdomen (KUB)

Barium study

Ultrasound

CT

MRI

Angiography

UPPER GI ; esophagus, stomach, duodenum

LOWER GI ; jejunum, ileum, colon

ABDOMENAL X-RAY

This is the first and initial exam of the abdomen

How To Assess The Film

- **Basic Details** [name], [age] [sex]. [date] and appears well/poorly penetrated”

-Establish the **projection** of the film (AP) and whether it is **supine** or **erect**. (why is it important to choose the appropriate x-ray position for appropriate exam ? in erect position we can see if there is air under the diaphragm which means perforation. In such cases we should ask for KUB or abdominal x-ray + chest x-ray)

-check **left** and **right**

-**Check** Bone, Soft tissue/Solid Organs, Calcification, Gas pattern & Artefacts

How To Assess The Film: Gas

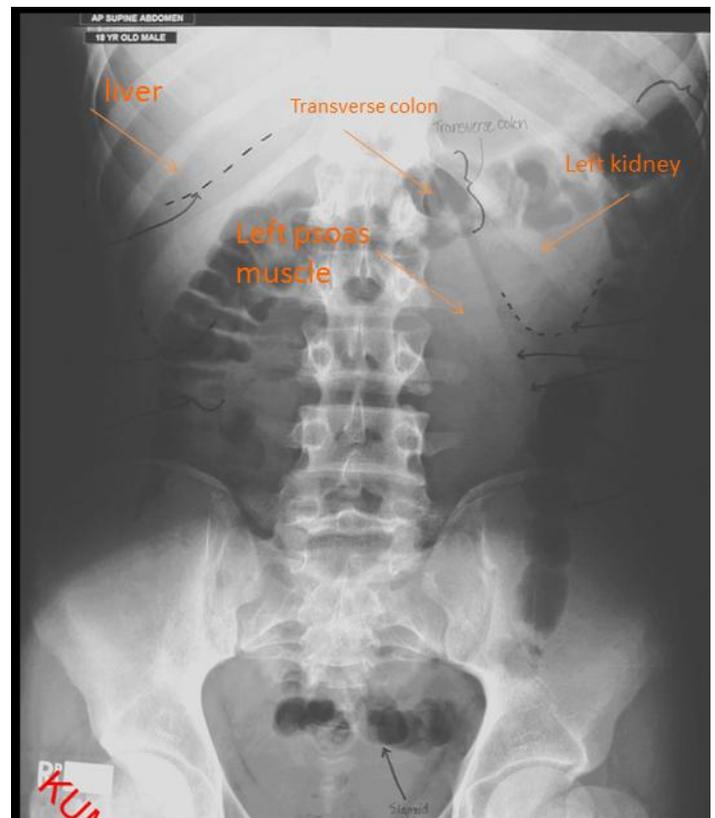
Essentially you're looking at the bowel here.

Before you start, **check** that there is **gas under the diaphragm** (if it is visible)

Look at small bowel and large bowel

SMALL BOWEL:

-Because of peristalsis the outline of the gas in the normal small bowel is often **broken up into many small pockets** (not fully filled with gases or solids)



-It is generally central in the abdomen

-Jejunum has 'valvulae conniventes', ileum is characteristically featureless

-The calibre of the normal small bowel should not exceed 2.5–3 cm

-If small bowel is *****visible at all, it suggests that it is abnormal

LARGE BOWEL:

-The caecum therefore normally contains semifluid material containing multiple pockets of gas and, like much of the right side of the bowel, assumes a granular appearance on X-rays, creating mottled areas of gas seen best against the background of the iliac bone.

-When visible the haustral folds of the colon may be seen, only partially visualised across part of the large bowel lumen.

How To Assess The Film: Bone

Ribs, spine, sacrum, pelvis & hips

Bones may show evidence of malignant disease

Sacro-iliitis may be associated with intestinal problems such as Crohn's disease

Excessively sclerotic bones may hint at other diseases e.g. Paget's (which can present as abdominal pain) or GI ulcers (which are associated with sclerotic bone lesions)

Don't forget to check the spine for conditions such as ank spondy

How To Assess The Film: Soft Tissue

Trace soft tissue outline for any clues as to pathology (e.g. obesity, trauma sites, abdo drains etc)

Also look for:

Psoas muscles

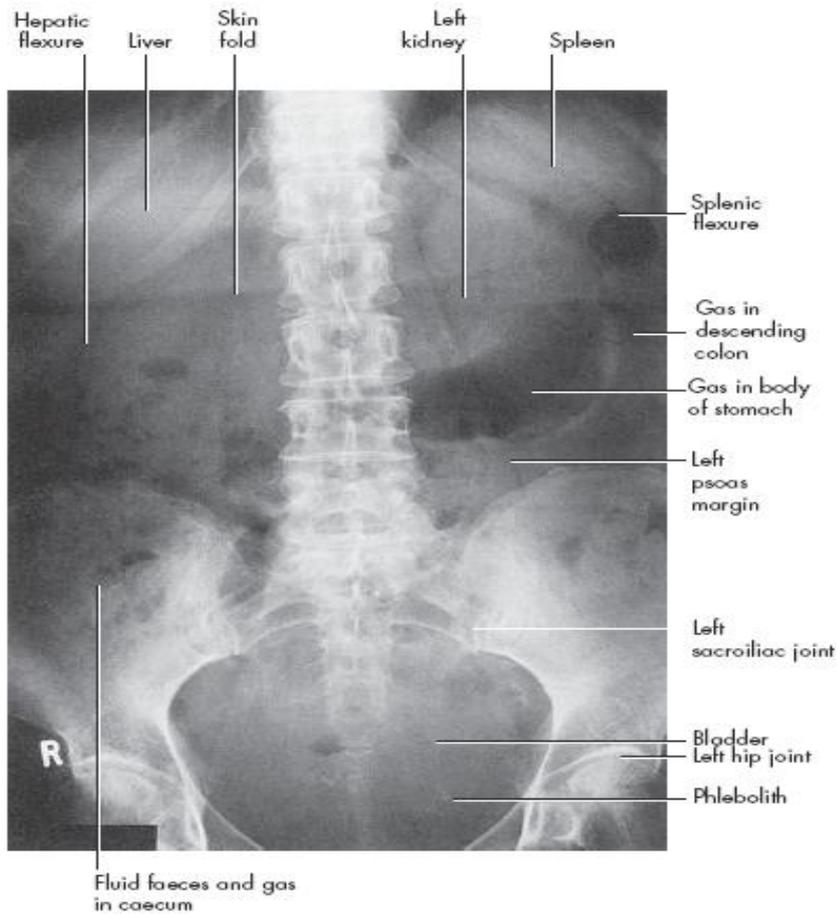
Kidneys (left is higher and slightly bigger than the right)

Liver (difficult to see but may be identifiable by lack of bowel in RUQ)

Spleen (difficult to see)

Bladder (visible if full, not always visible if empty) – a full bladder may hint that you are looking for an acute problem, rather than a chronic one

Uterus (causes a dent in the top of the bladder on IVU)



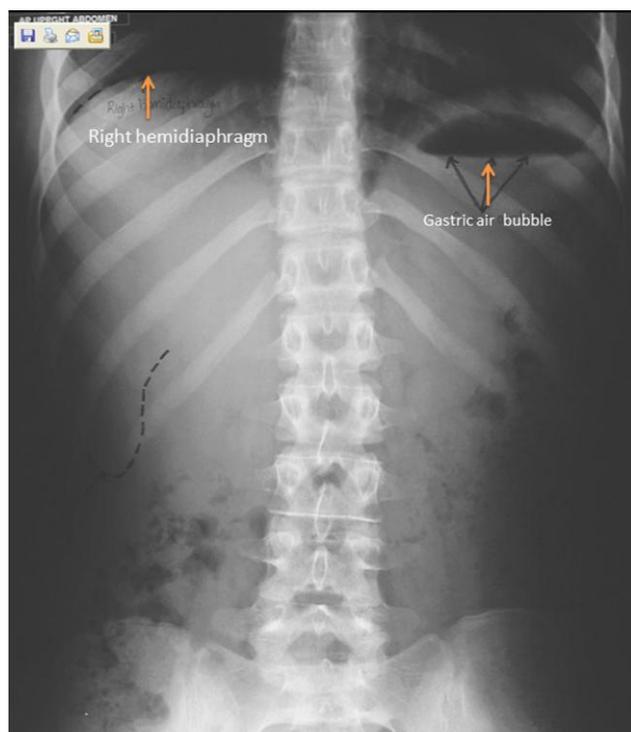
-These are usually done with the patient lying down (**supine film**).

-**Erect films** are used to show any fluid levels (**suspects either obstruction or ileus**)

-If you are given a **CXR and an AXR**, the clinician is probably interested in **air under the diaphragm** and so suspect diseases that feature **perforation** as a complication (e.g. **IBD & diverticular disease**)

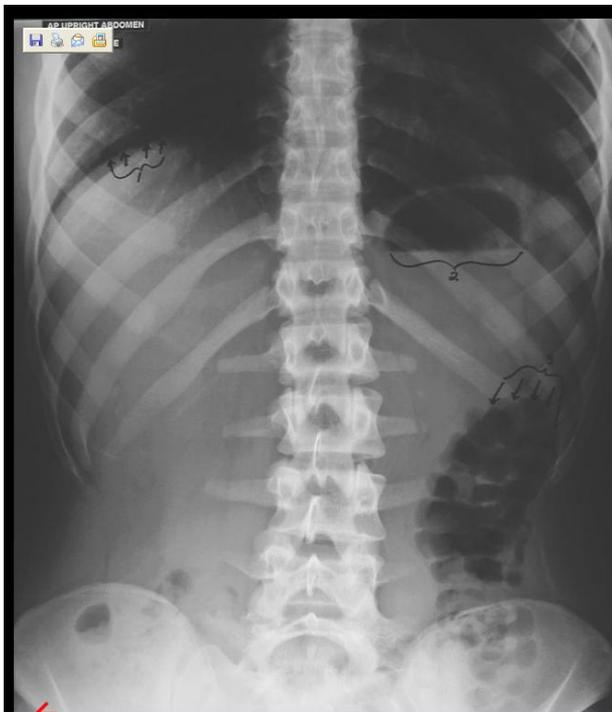
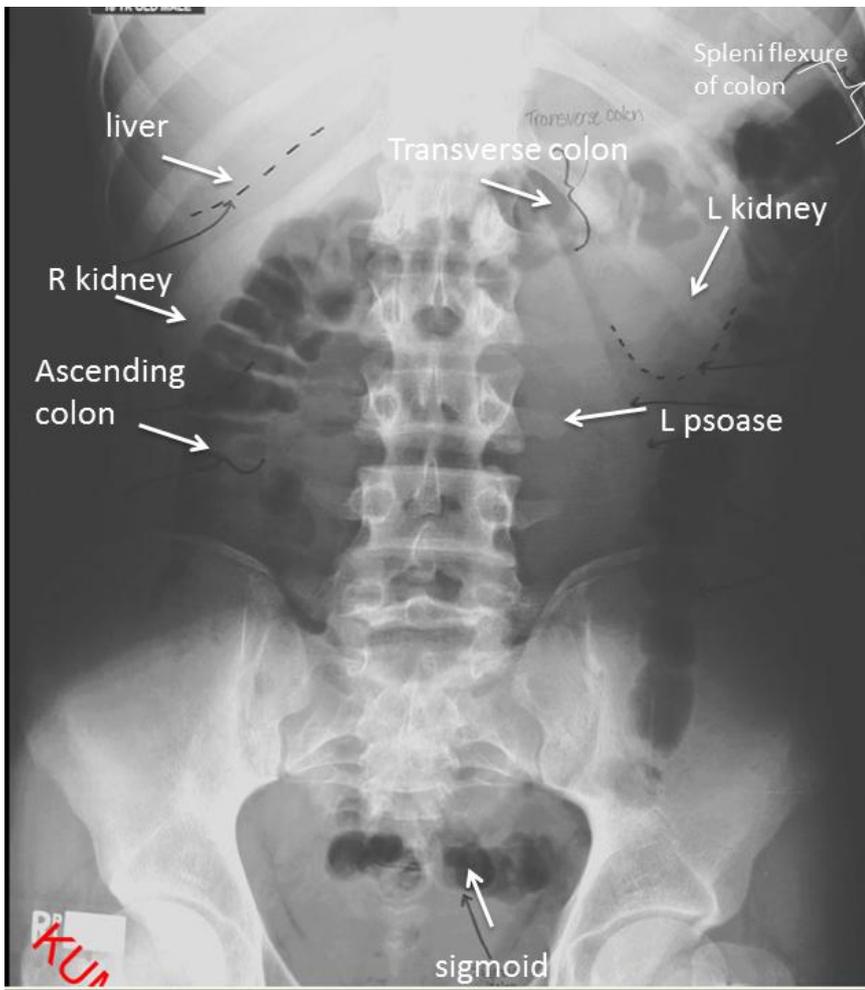
-An AXR should include the lower anterior ribs

-Ideally, patients should have empty bladders for an AXR



How to differentiate between air in the stomach and perforation ?

- 1- air-fluid level + left side + the air is contained not spreading here & there >>> means this is the stomach
- 2- if the air is extending here & there >> means perforation





- Right transverse process of L3
- Psoas major muscle
- Ala of sacrum
- Left sacroiliac joint
- Coccyx
- Ischial spine
- Left 12th rib
- Iliac crest



- A Lateral margin of the psoas muscle
- B Inferior pole of the left kidney
- C Left L5-S1 facet joint
- D Left sacroiliac joint

How To Assess The Film: Calcification

Calcification occurs in:

-**Calculi** (look in kidney, ureters & bladder)

-**Phleboliths** (usually within pelvis, look like silt) they are calcified veins

-**Appendicoliths** (caused by faeces in appendix, may suggest appendicitis)

-**Lymph nodes**

-**Aortic calcification** (aortic calcification is normal as age increases but you must check the aorta as asymmetry of the walls suggests aortic aneurysm)



Phlebolith



Calcified lymph nodes



Calcification of a normal aorta

Barium Swallow

-Single contrast study, used mainly to look at the oesophagus

-Liquid barium is swallowed in an upright and prone position and radiographs are taken during the oesophageal phase of transit

*We use single contrast when we are looking for GROSS things e.g. mass, obstruction, narrowing ... We say single contrast when there is only liquid no air here

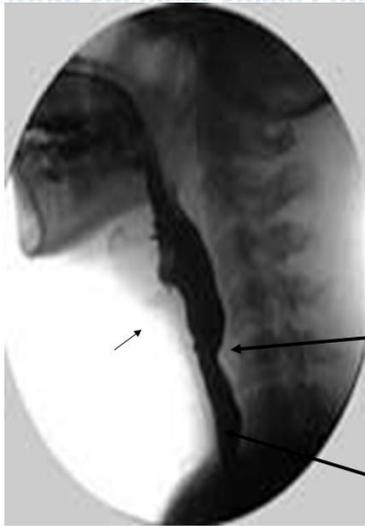
*We use double contrast when we are looking for details e.g. ulcers, assessing the mucosa ...

*Indications of barium swallow: Ulcers, perforation, obstruction, narrowing, reflux

*For reflux we give barium swallow & barium meal

Fluoroscopy is an x-ray examination of the upper GI using barium as a contrast material

Barium Swallow, Single Contrast

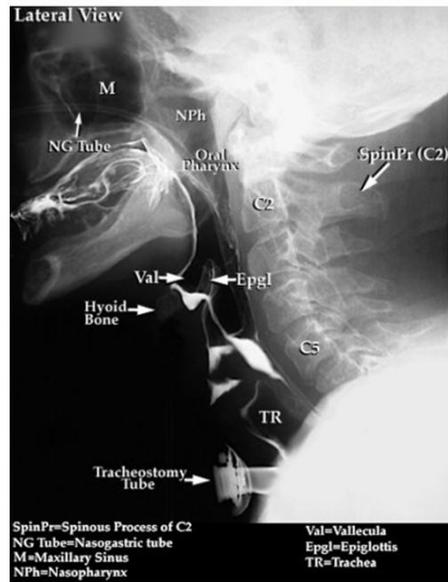


Cricopharyngeus Muscle
At level of C5-C6,
Part of upper esophageal
sphincter (UES)
Normal indentation of the
upper esophagus

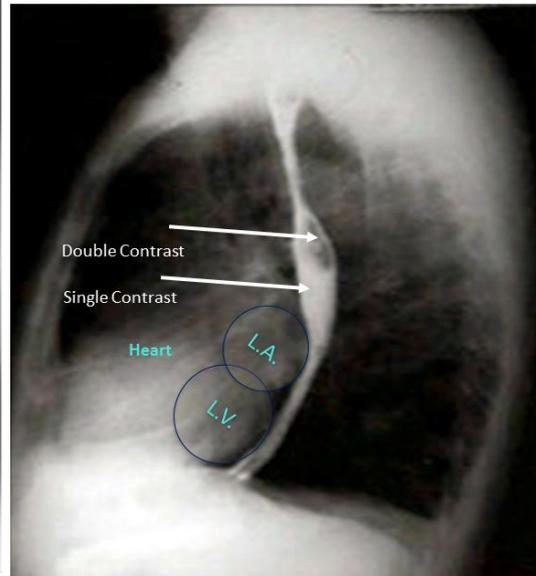
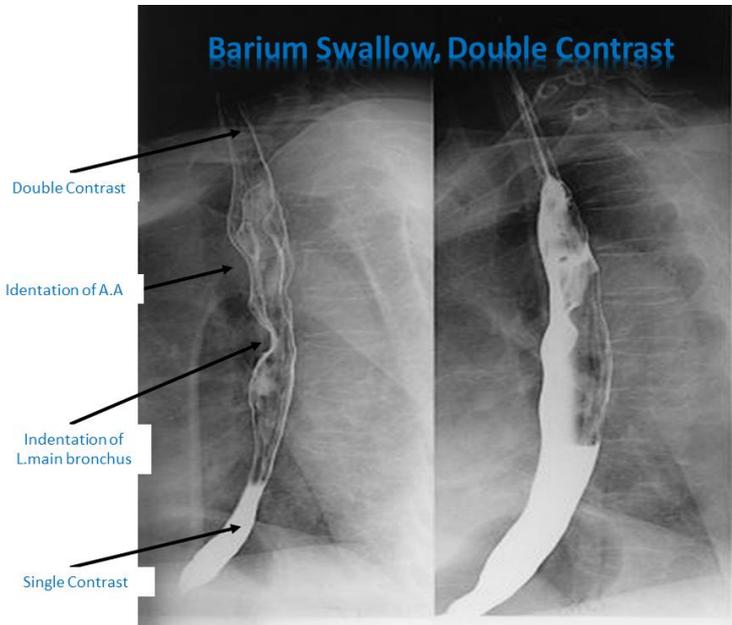
Esophagus

Main Indication:
Dysphagia

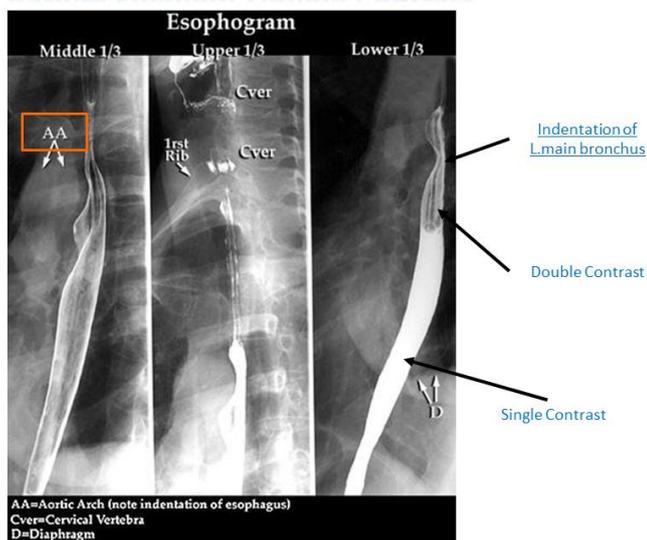
Barium Swallow, Single Contrast



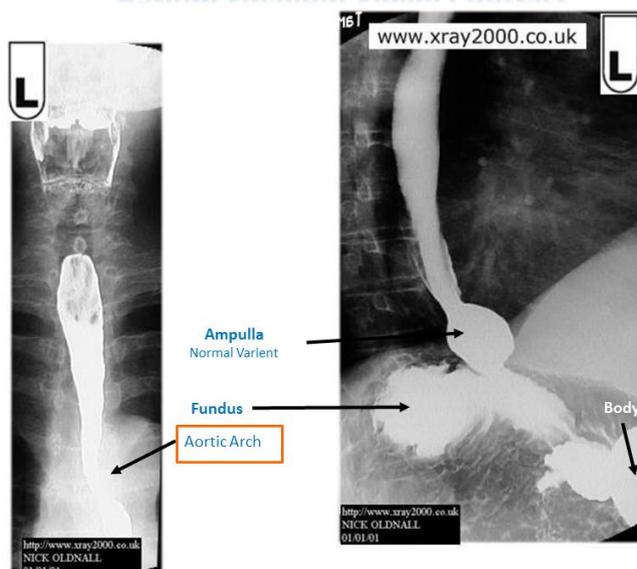
Barium Swallow, Double Contrast



Barium Swallow, Double Contrast



Barium Swallow, Single Contrast



Barium Swallow, Double Contrast

www.xray2000.co.uk



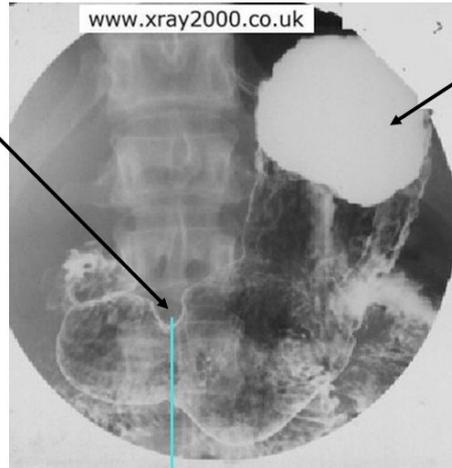
Narrowing:
Could be peristalsis
So other shot is advised

http://www.xray2000.co.uk
NICK OLDNALL
01.01.01

Barium Meal, Double Contrast (Supine Position)

Supine Position:
Note Barium Distribution in
the Fundus due to gravity

www.xray2000.co.uk

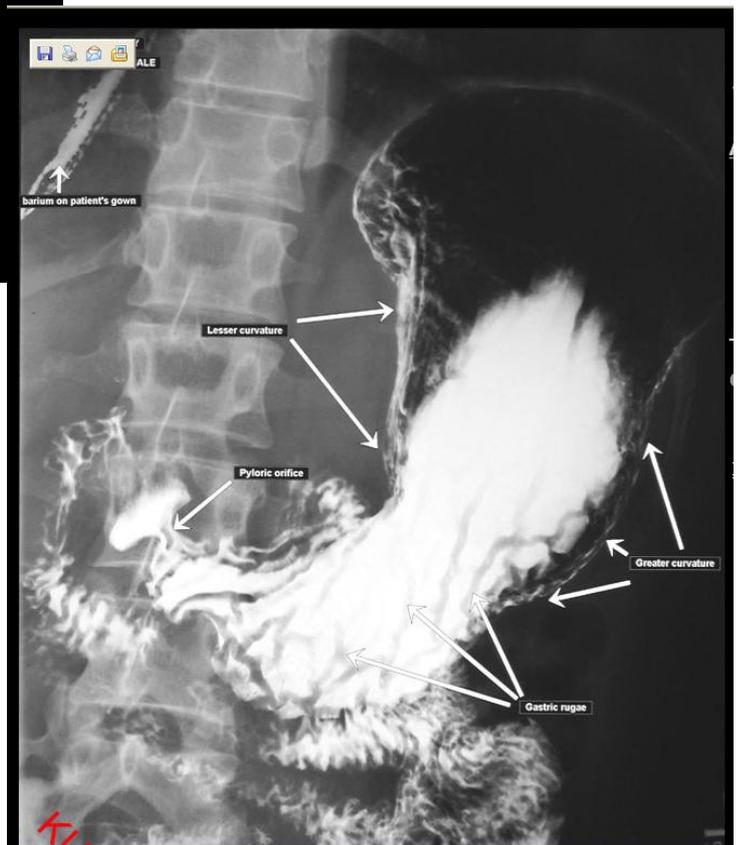
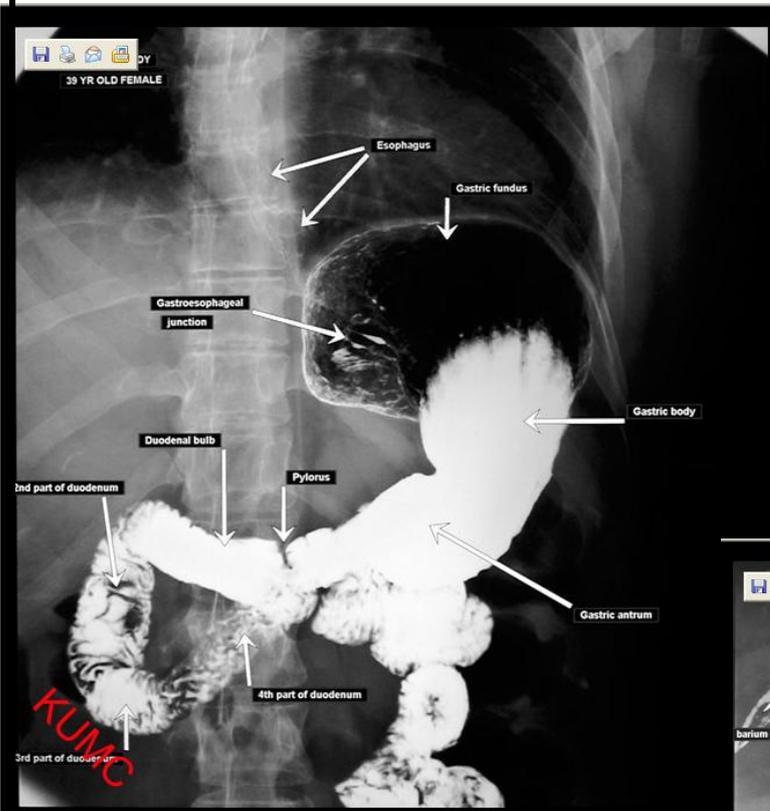


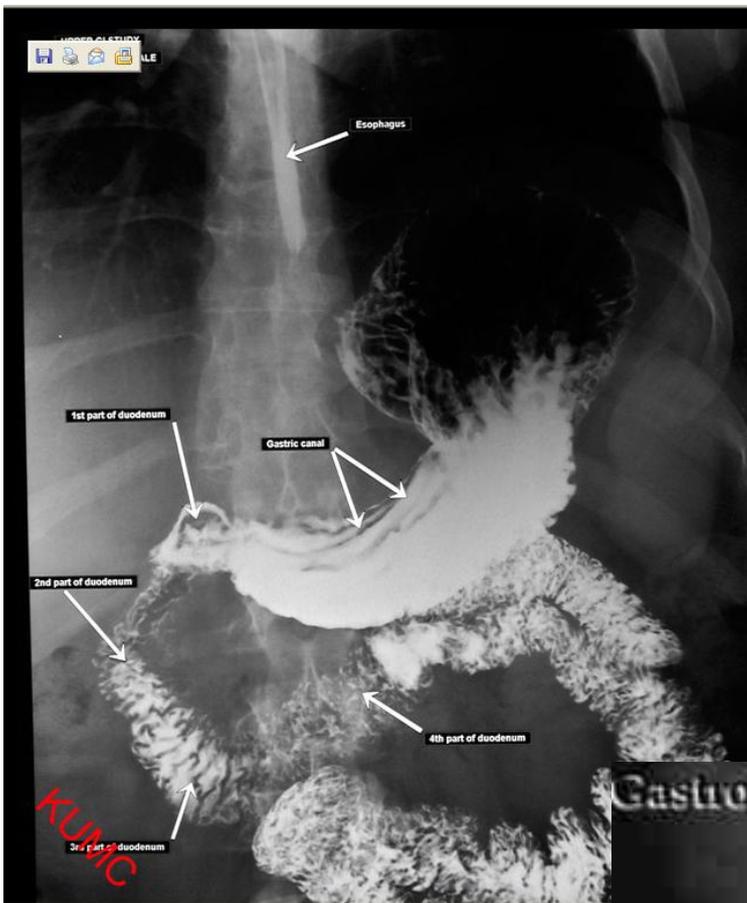
Angular Notch
Incisura Angularis

What we are looking
at in barium meal?
Lower esophagus,
gastroesophageal
junction, stomach &
duodenum

What are the
indications for
barium meal?
Obstruction,
narrowing of
duodenum, masses,
peptic ulcer, pyloric
stenosis in pediatrics

← Antrum → ← Body →





Barium Follow-Through

Barium follow-through; patient is drinking the contrast and we take the images later on

Used to examine **duodenum, jejunum and ileum**

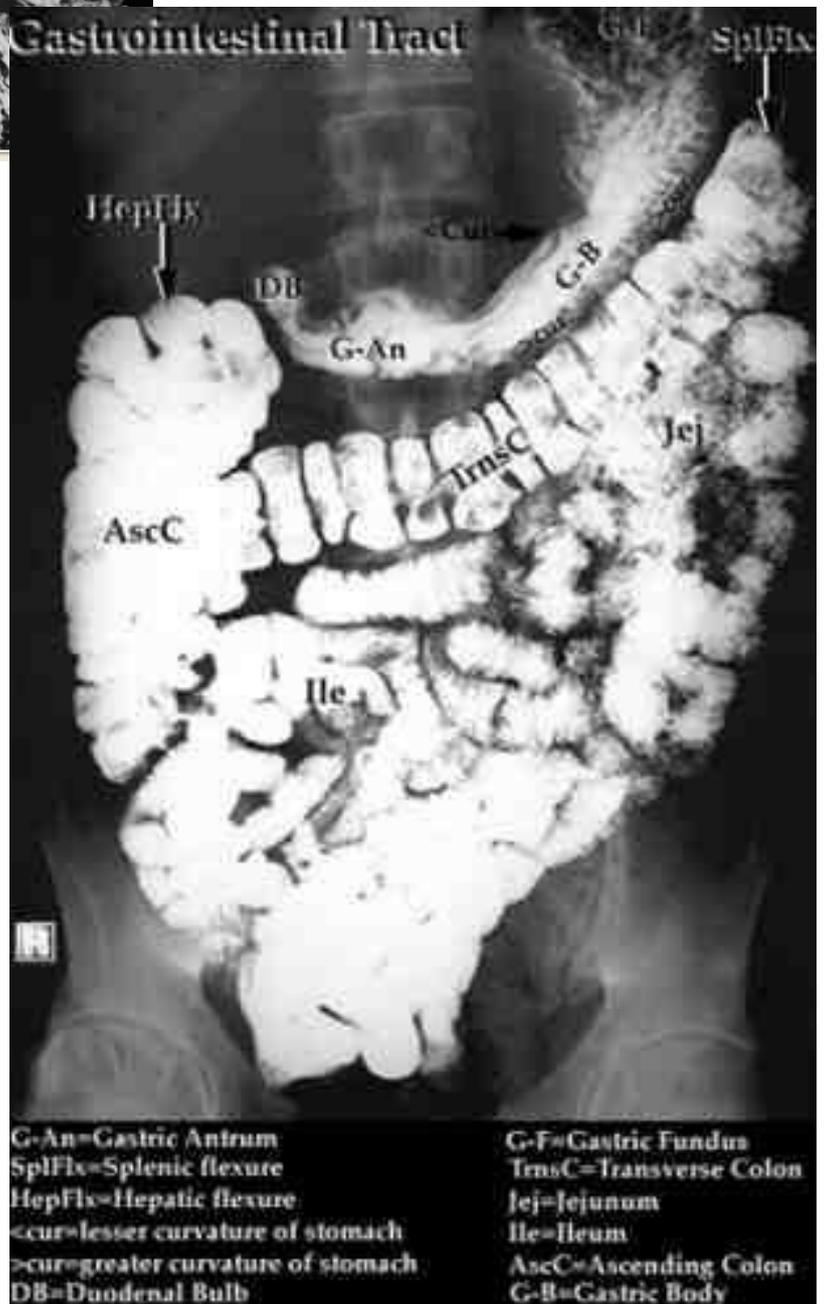
Like a barium swallow but images taken every 20 minutes or so for 2-3 hours

Small bowel follow-through may reveal evidence of disorders such as **Crohn's disease, Coeliac disease or small bowel tumours**

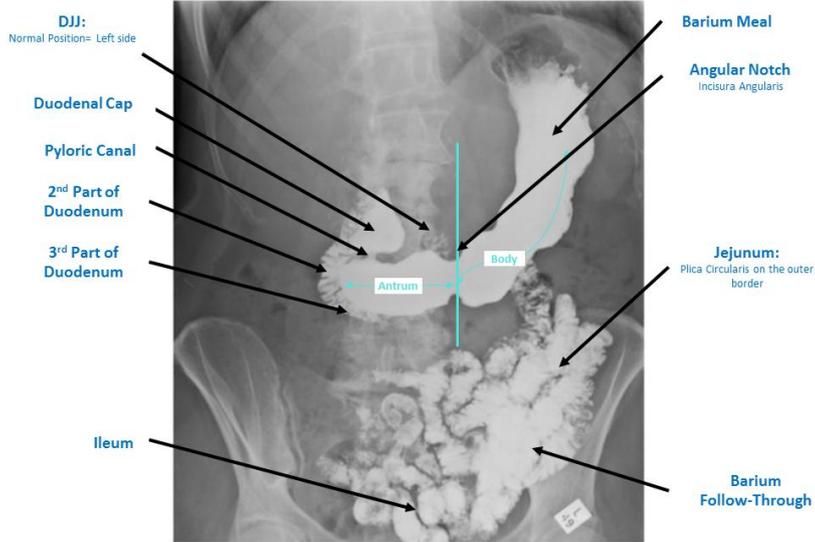
How can we differentiate between jejunum and ileum ?

1- by the position ; jejunum is in the left side while ileum is in the right side

2- by the appearance ; Jejunum has 'valvulae conniventes', **ileum** is characteristically **featureless**



Barium Meal + Follow-Through (Erect Position)



Barium Follow-Through to Cecum (Erect Position)



Small Bowel Enema

A Modified Follow-Through which is called **Small Bowel Enema** note that the bowel is more distended here

This procedure involves **inserting a thin tube** through the mouth, esophagus and past the stomach to inject barium, methylcellulose and water into the small bowel. **This allows for better visualization** of the small bowel than can be seen during a small bowel follow-through



large bowel Barium Enema

-Single or double contrast study.

-Double contrast means air fired up after barium – pictures may show coating on the outline of the bowel rather than a white bowel (right)

-Patient has to have:

*low residue diet for three days before the procedure

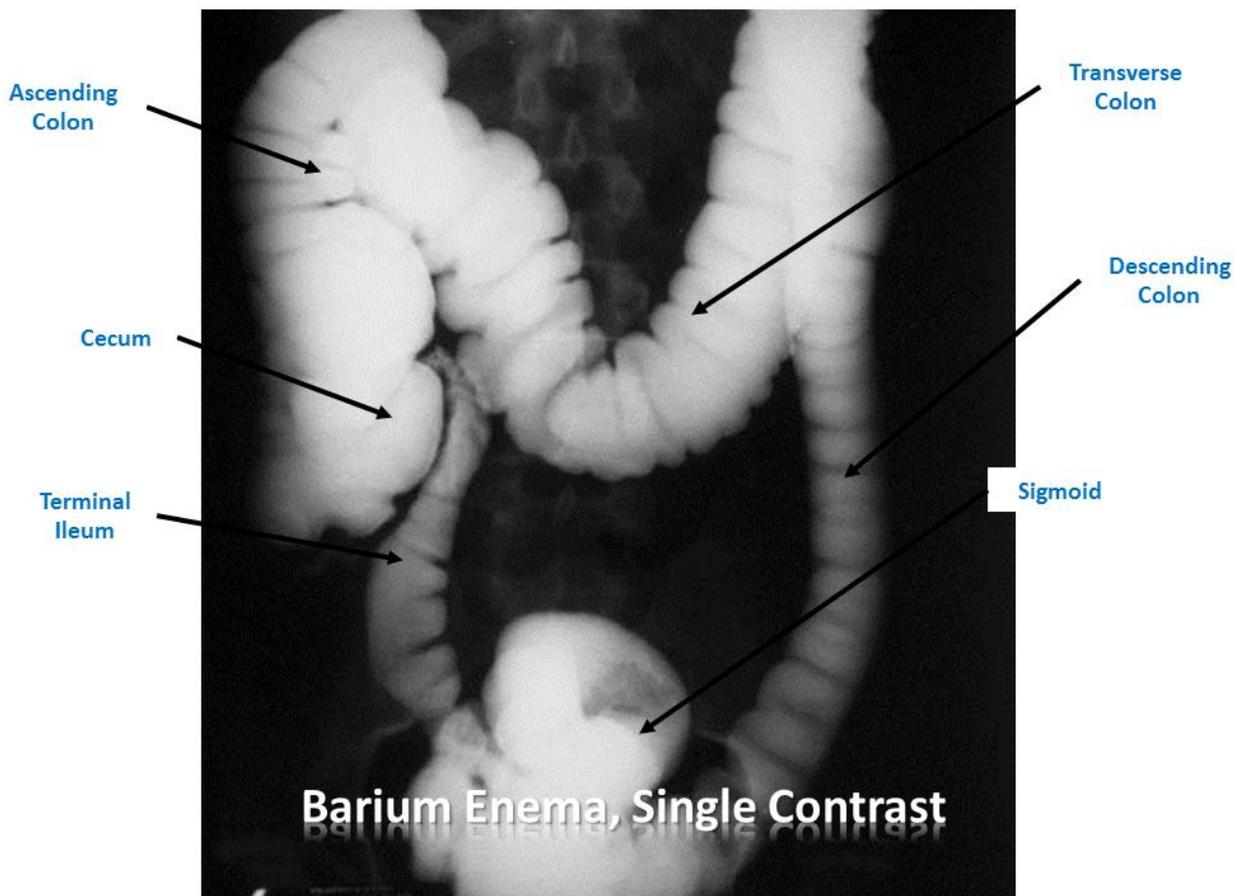
*laxatives 24 hr before

*bowel prep just before

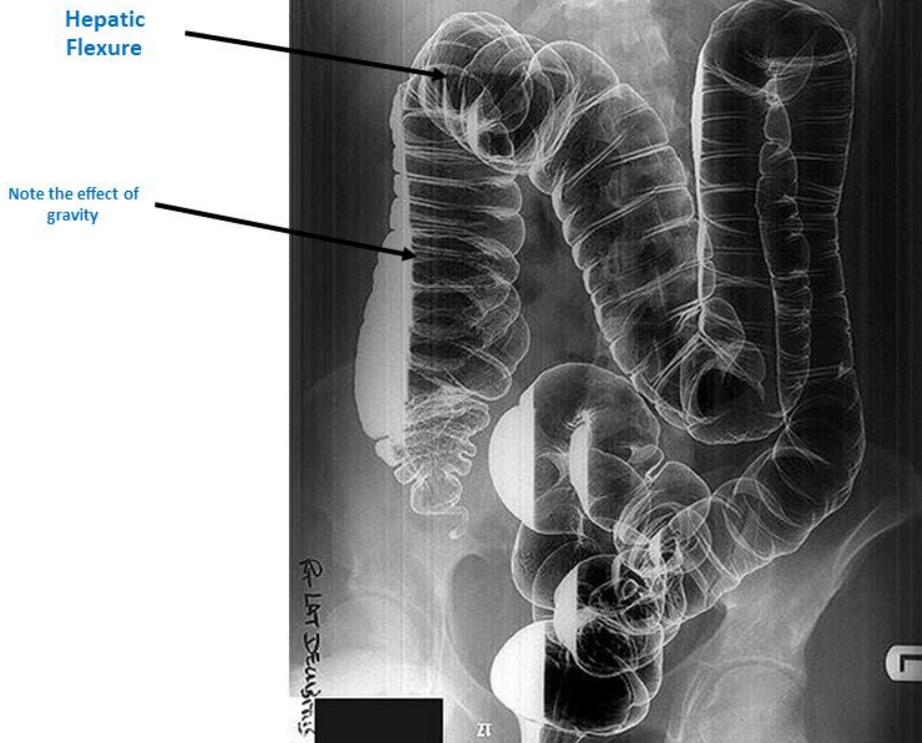
-Barium up the bum, patient has to move into different positions to coat to the whole colon. Often the table moves about to help the passage of barium. Serial X-rays are taken

-Films can be small and only cover a small area of bowel

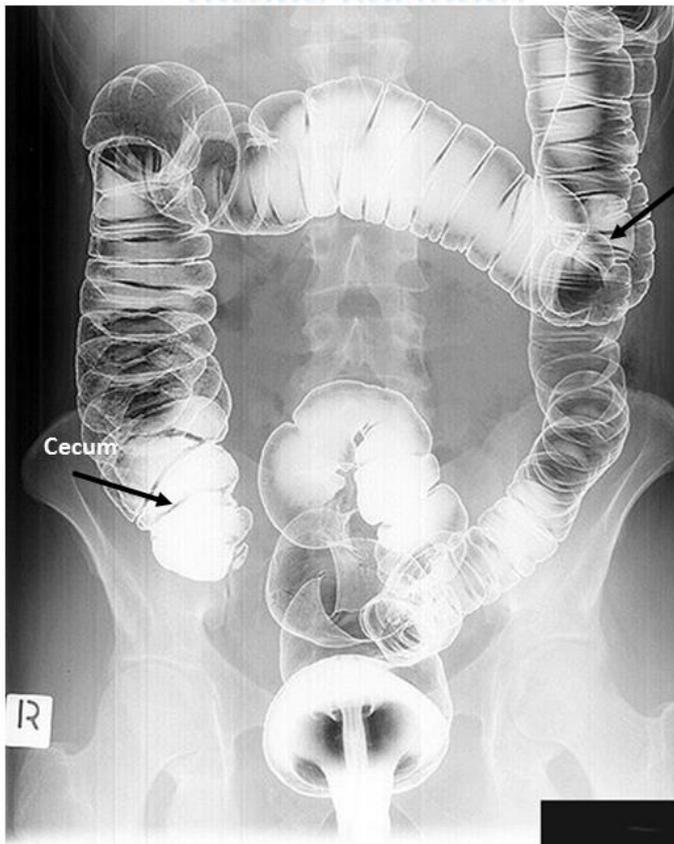
-Indications : inflammation, bstruction , infection , tumor



Barium Enema, Double Contrast (Right Lateral Decubitus)

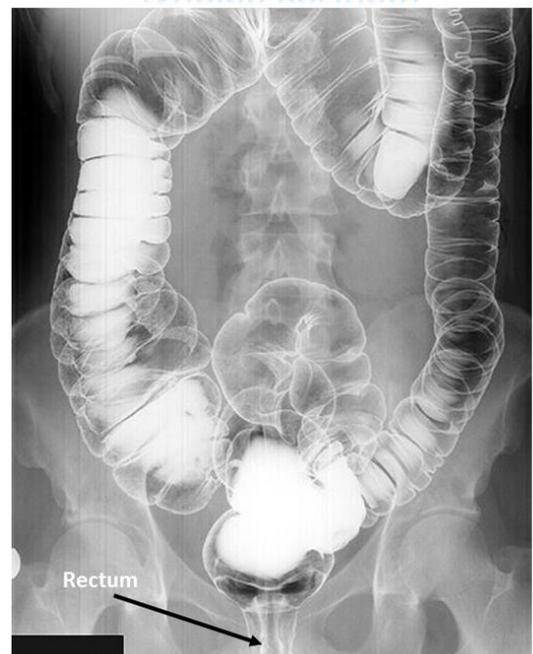


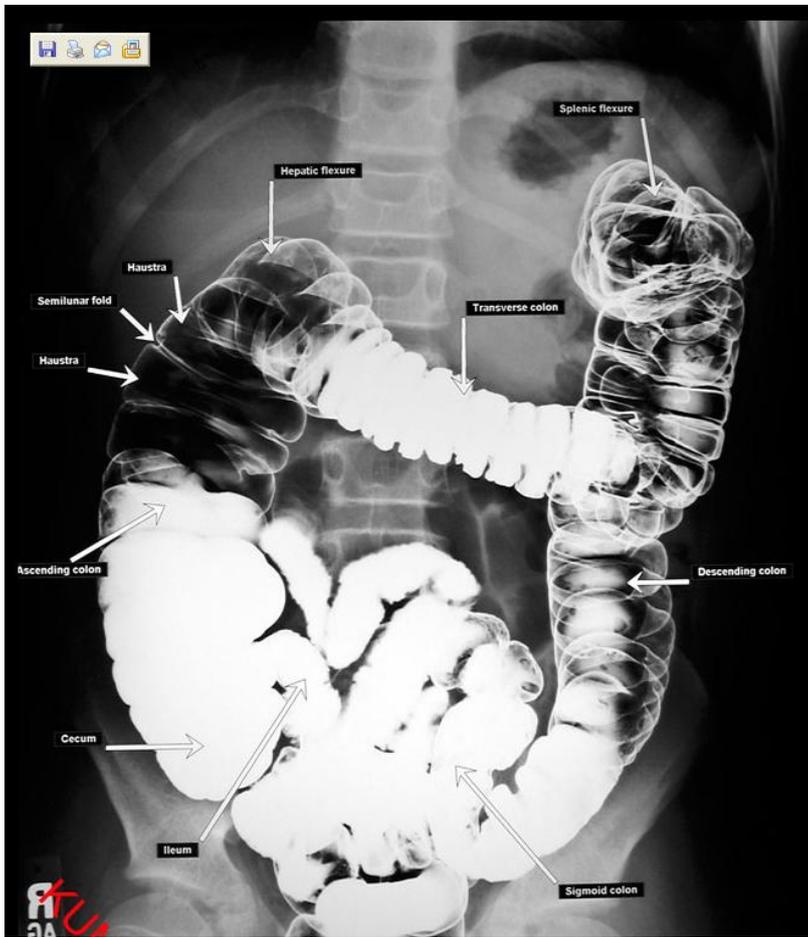
Barium Enema, Double Contrast (Prone Position)



Note the
Haustrations
If lost → UC (IBD)

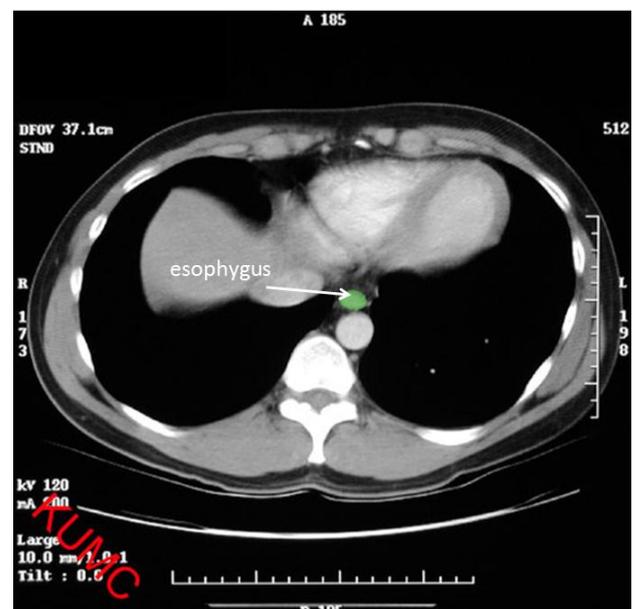
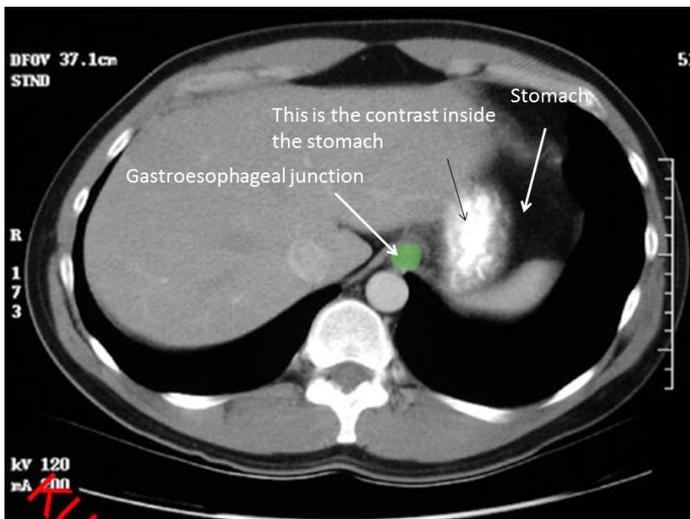
Barium Enema, Double Contrast (Supine Position)

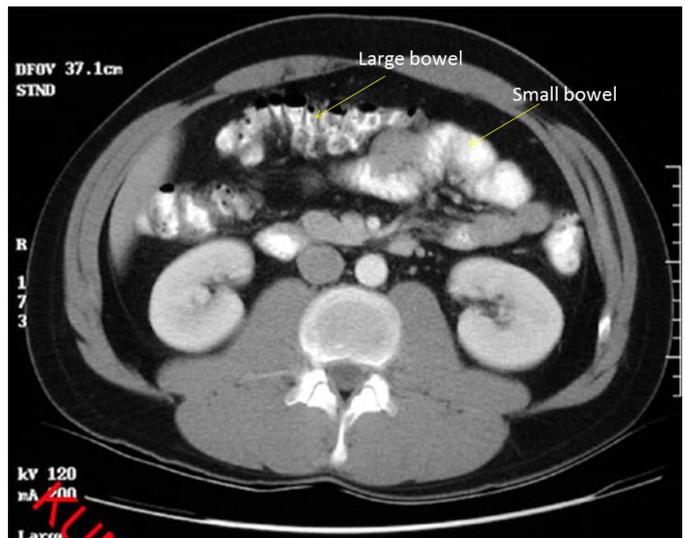
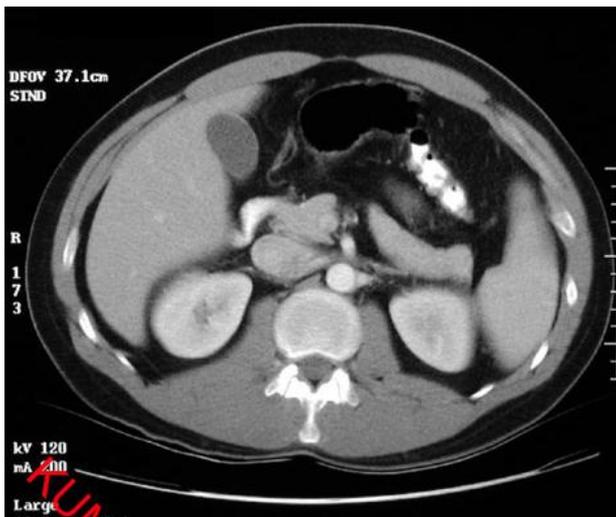
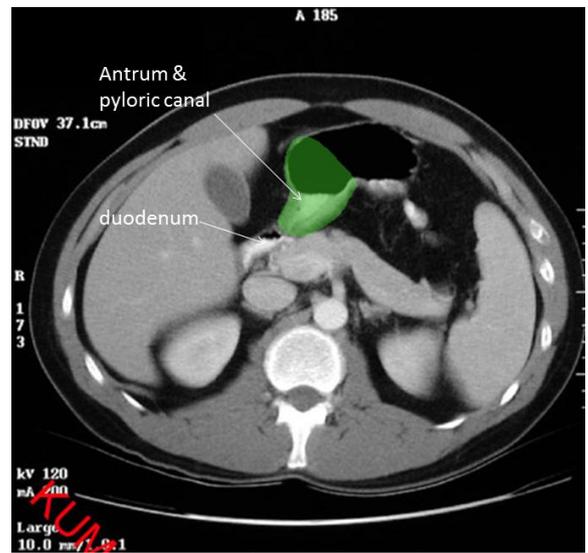
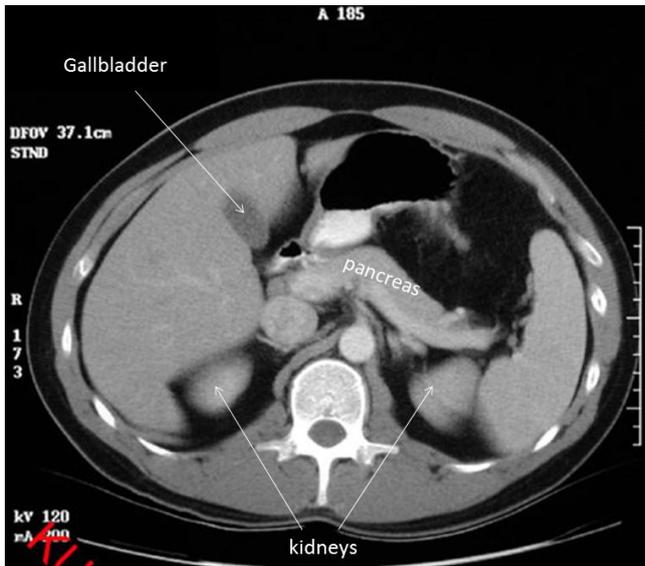
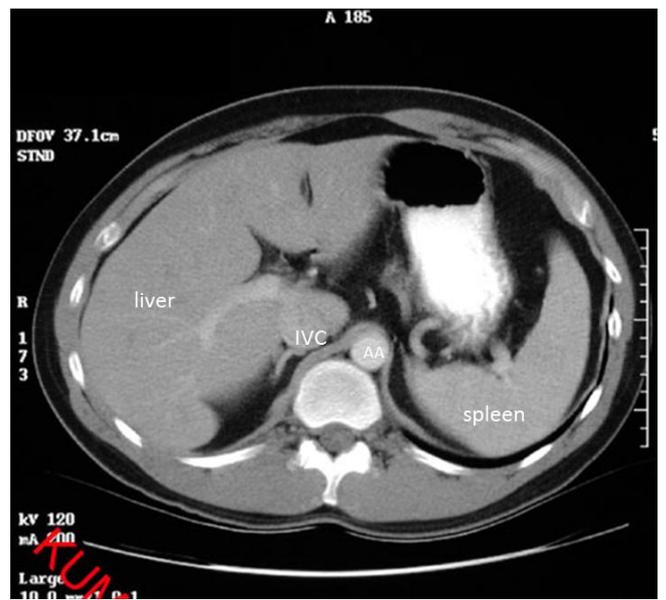
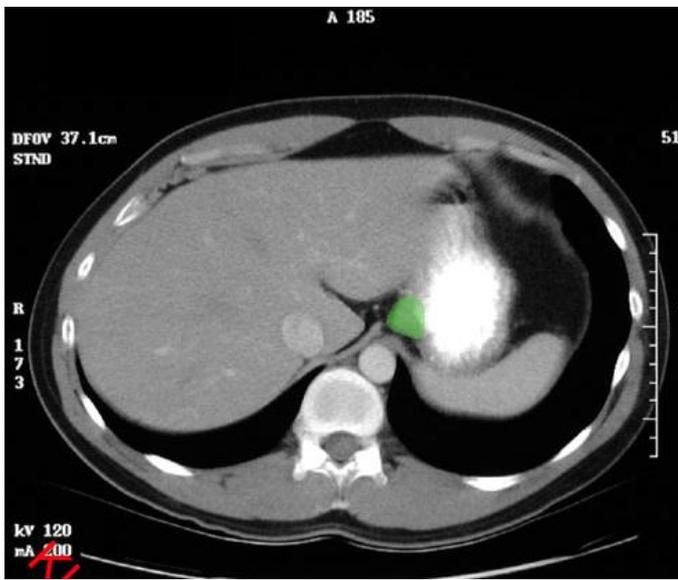


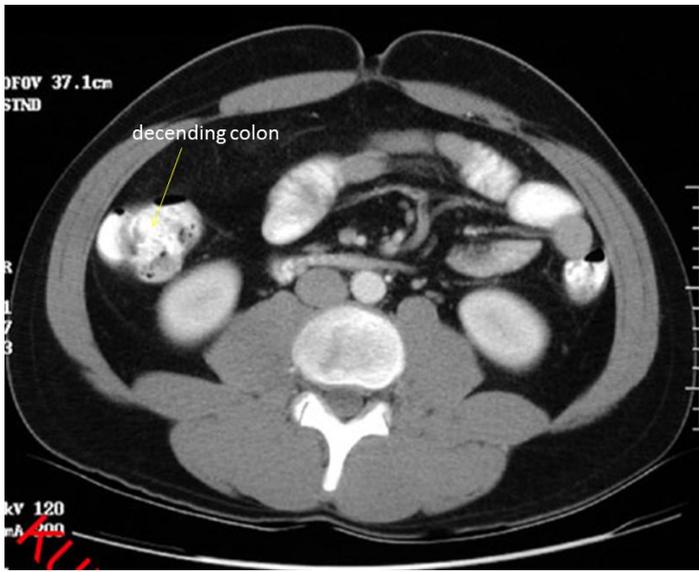


COMPUTED TOMOGRAPHY

- CT provides cross-sectional images of abdominal organs and structures. Multiple x-ray images are taken from many different angles, digitized in the computer, reconstructed, and then viewed on a computer monitor.
- Indications for abdominal CT scanning include diseases of the liver, spleen, kidney, pancreas, and pelvic organs. It is a valuable tool in detecting and localizing many inflammatory conditions in the colon, such as appendicitis, diverticulitis, regional enteritis, and ulcerative colitis.
- Instruct the patient not to eat or drink for 6 to 8 hours before the test.
- If the patient is prescribed with intravenous or oral contrast agents, question the patient about contrast dye allergies.
- Schedule barium studies after CT scanning, so as not to interfere with imaging.







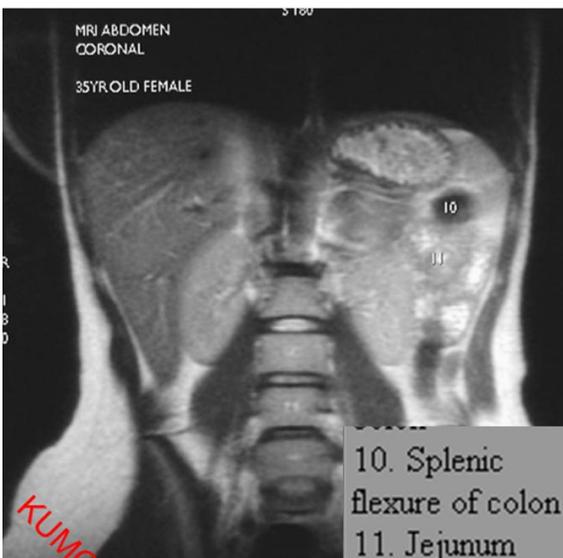
MRI

MRI is useful in evaluating abdominal soft tissues as well as blood vessels, abscesses, fistulas, neoplasms, and other sources of bleeding.



ANATOMICAL FEATURES:

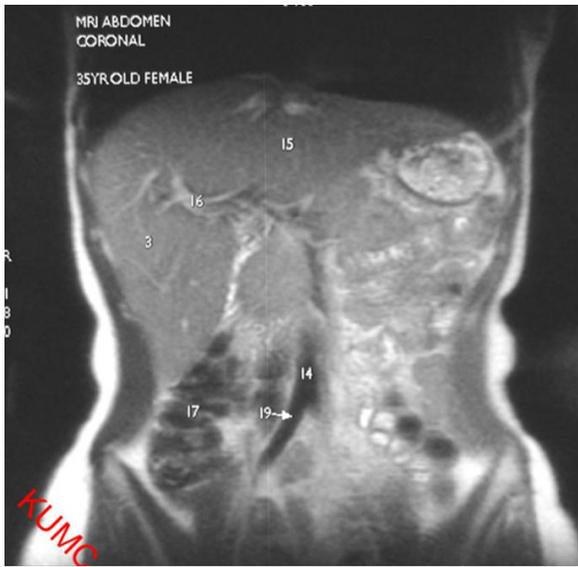
1. Erector spinae muscles
2. Spinal canal
3. Right lobe of liver
4. Spleen
5. Right kidney
6. Left kidney
7. Stomach
8. Psoas major muscle
9. Descending colon
10. Sigmoid



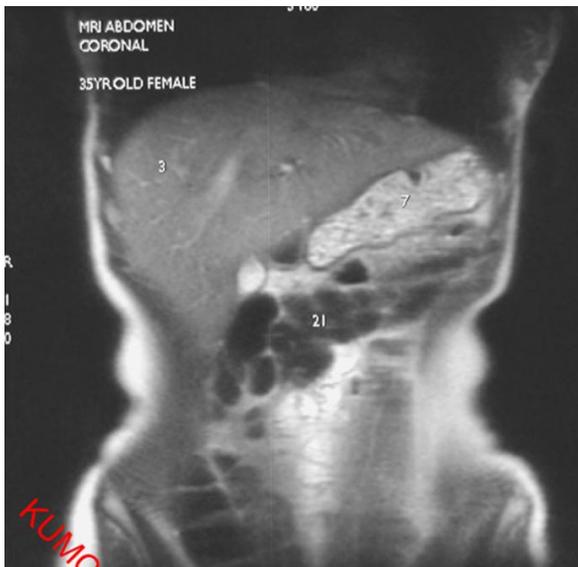
10. Splenic flexure of colon
11. Jejunum



6. Left kidney
7. Stomach
8. Psoas major muscle
9. Descending colon
10. Splenic flexure of colon
11. Jejunum
12. Hepatic veins



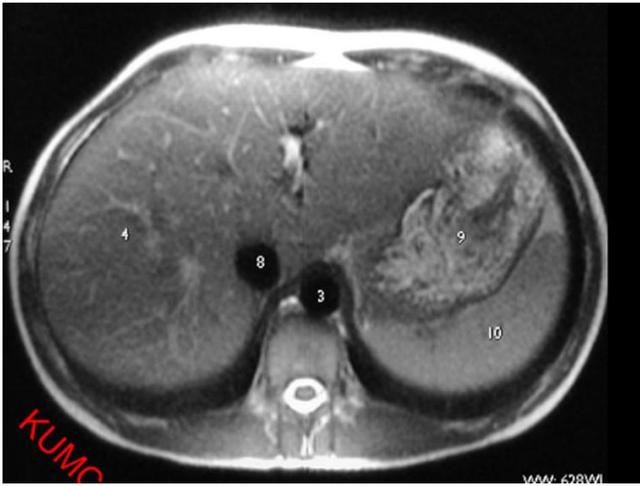
- 3. Right lobe of liver
- 4. Spleen
- 5. Right kidney
- 6. Left kidney
- 7. Stomach
- 8. Psoas major muscle
- 9. Descending colon
- 10. Splenic flexure of colon
- 11. Jejunum
- 12. Hepatic veins
- 13. Inferior vena cava
- 14. Aorta
- 15. Left lobe of liver
- 16. Portal vein
- 17. Ascending colon
- 18. Left common iliac artery
- 19. Right common iliac artery



- 7. Stomach
- 8. Psoas major muscle
- 9. Descending colon
- 10. Splenic flexure of colon
- 11. Jejunum
- 12. Hepatic veins
- 13. Inferior vena cava
- 14. Aorta
- 15. Left lobe of liver
- 16. Portal vein
- 17. Ascending colon
- 18. Left common iliac artery
- 19. Right common iliac artery
- 20. Ileum
- 21. Transverse colon



- 3. Aorta
- 4. Liver
- 5. Left hepatic vein
- 6. Middle hepatic vein
- 7. Right hepatic vein
- 8. Inferior vena cava
- 9. Stomach
- 10. Spleen



ANATOMICAL FEATURES:

1. Right ventricle
2. Left ventricle
3. Aorta
4. Liver
5. Left hepatic vein
6. Middle hepatic vein
7. Right hepatic vein
8. Inferior vena cava
9. Stomach
10. Spleen
11. Right side of



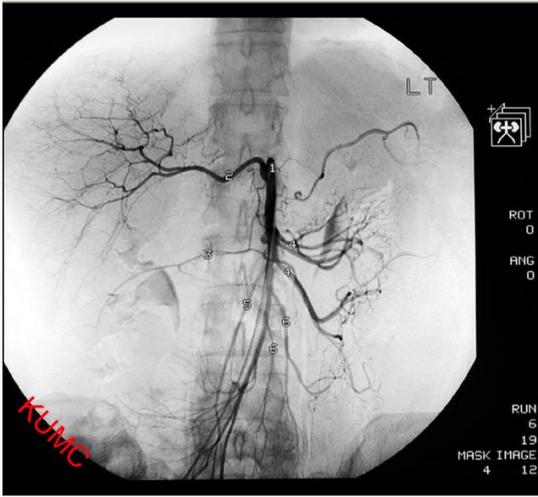
18. Right kidney
19. Left kidney
20. Head of pancreas
21. Jejunum



4. Vagina
5. Urinary bladder
6. Pubic bone
7. Vertebral body-L5
8. Sacrum
9. Endocervical canal
10. Rectouterine pouch (cul-de-sac of douglas)
11. Anal canal
12. Vesicouterine pouch
13. Urethra
14. Endometrium
15. Coccyx

Angiography

Indications : To assess the blood vessels >> we might see Stenosis , obstruction , atherosclerosis & thrombosis



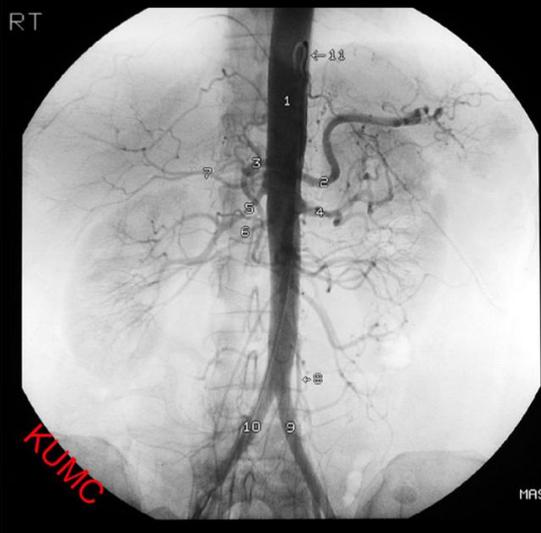
- 1 Superior mesenteric artery (SMA)
- 2 Replaced right hepatic artery
- 3 Right colic artery
- 4 Jejunal (intestinal) arteries
- 5 Ileocolic artery
- 6 Ileal (intestinal) arteries



- Right hepatic artery is replaced and originates off of SMA (normal variant)
- 1 Celiac trunk
 - 2 Splenic artery
 - 3 Common hepatic artery
 - 4 Gastroduodenal artery
 - 5 Right gastric artery
 - 6 Left hepatic artery
 - 7 Pancreaticoduodenal arteries
 - 8 Left gastric artery (origin off celiac not visualized)
 - 9 Right gastroepiploic artery



- 1 Abdominal aortal
- 2 Celiac trunk
- 3 Splenic artery
- 4 Common hepatic artery
- 5 Superior mesenteric artery
- 6 Inferior mesenteric artery
- 7 Catheter in lumen of aorta



- 1 Abdominal aorta
- 2 Splenic artery
- 3 Common hepatic artery
- 4 Left renal artery
- 5 Right renal artery
- 6 Accessory right renal artery
- 7 Right hepatic artery
- 8 Inferior mesenteric artery
- 9 Left iliac artery
- 10 Right iliac artery
- 11 Catheter in lumen of aorta



- 1 Celiac artery (trunk)
- 2 Left gastric artery
- 3 Common hepatic artery
- 4 Splenic artery
- 5 Hepatic artery proper
- 6 Left hepatic artery
- 7 Right hepatic artery
- 8 Gastroduodenal artery
- 9 Right gastroepiploic artery



- 1 Superior mesenteric artery
- 2 Middle colic artery
- 3 Right colic artery
- 4 Jejunal arteries
- 5 Ileocolic artery
- 6 Marginal artery
- 7 Colic branch of ileocolic artery
- 8 Ileal branch of ileocolic artery
- 9 Ileal arteries