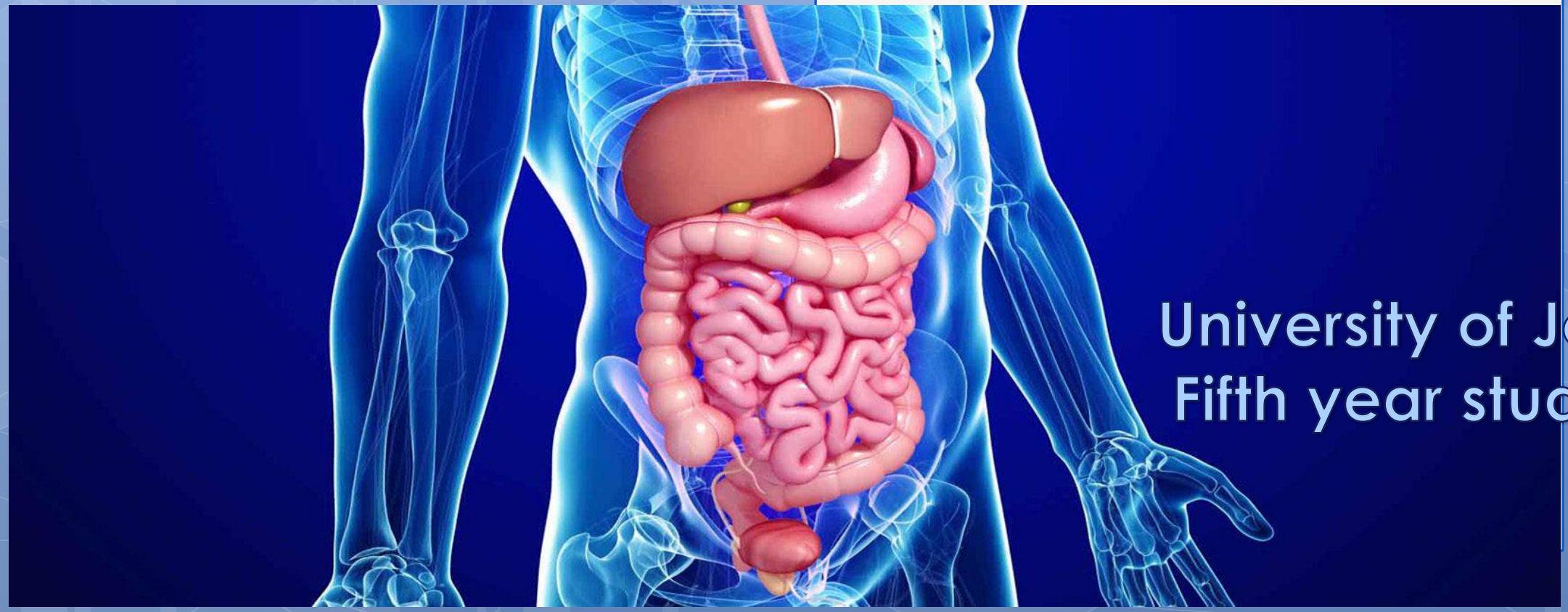
GIS radiology



University of Jordan
Fifth year students

GI SYSTEM

ANATOMY

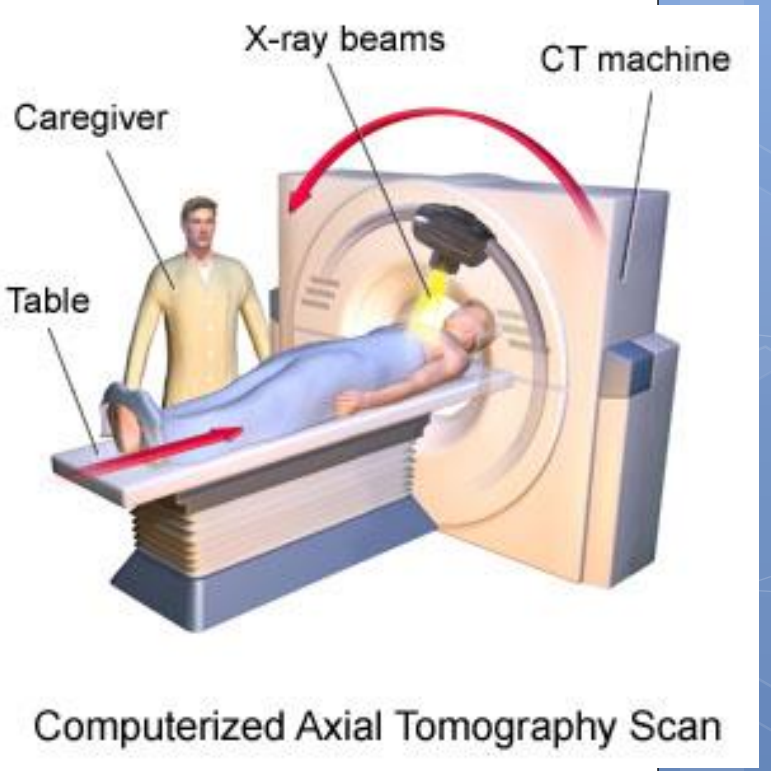
PATHOLOGY

GIS ANATOMY

- In CT images …

CT …

It obtains a series of different angular x-ray projections that are processed by a computer to give a section of specified thickness.

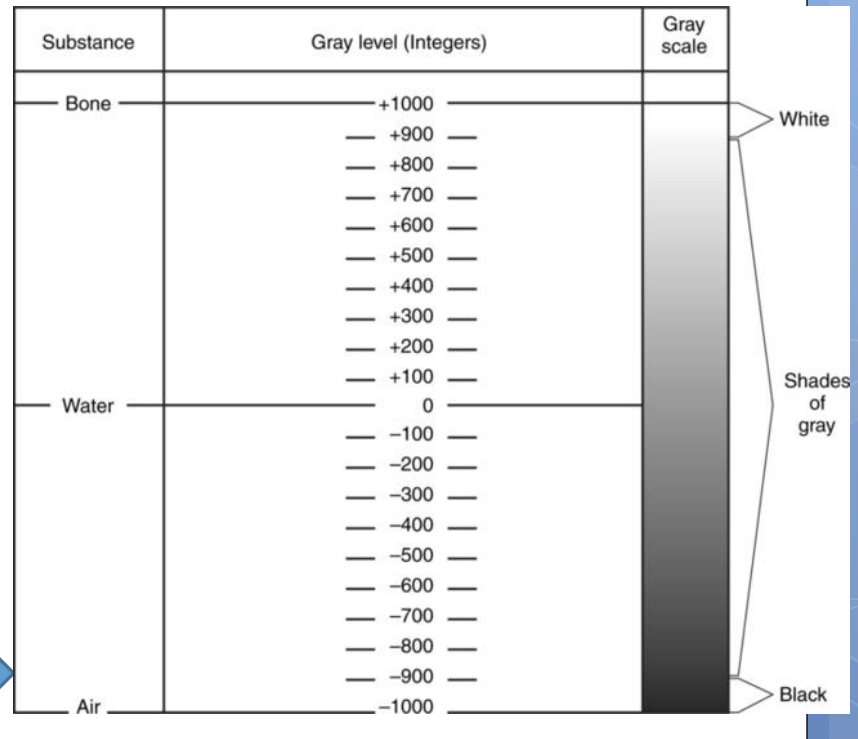


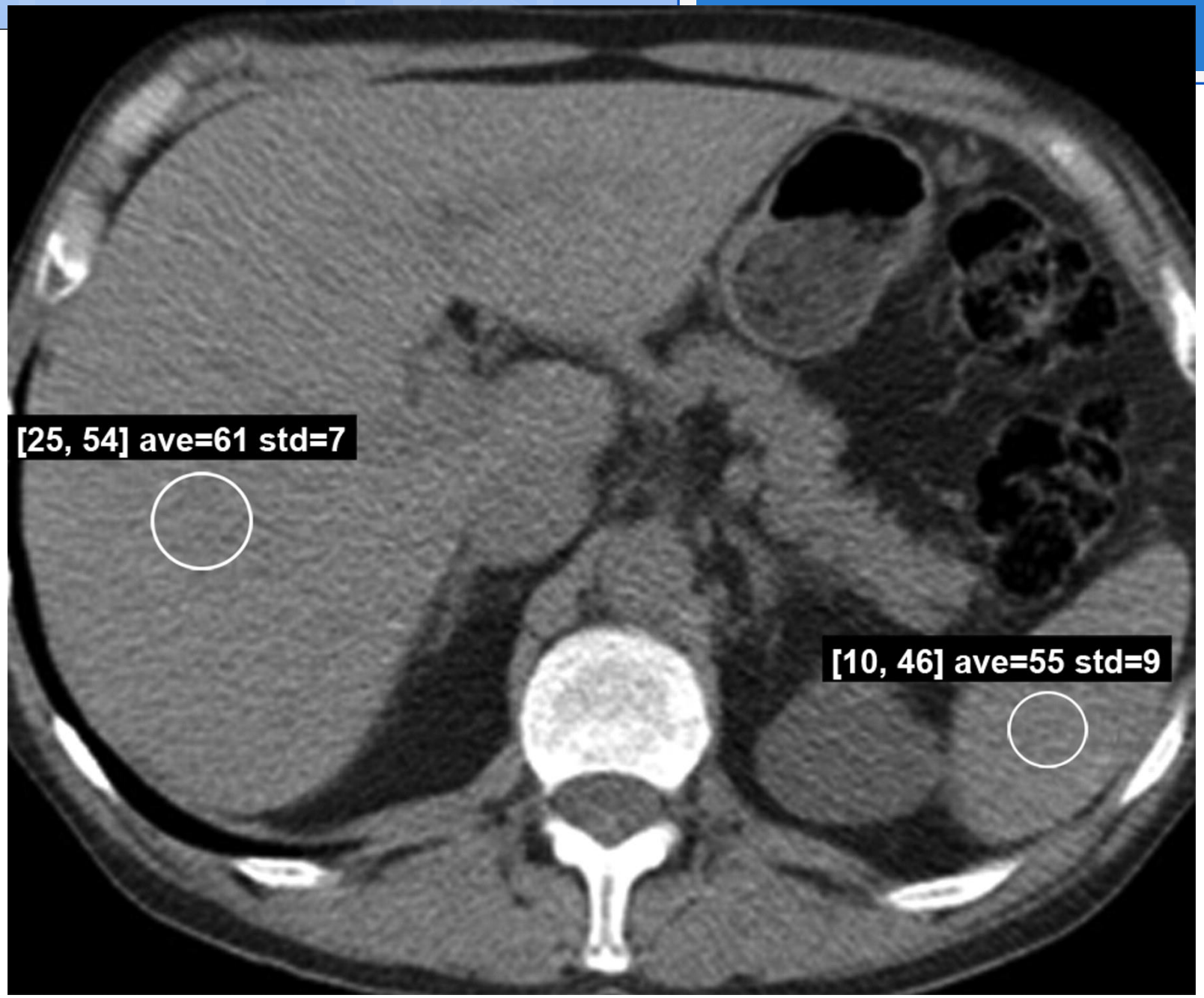
Computerized Axial Tomography Scan

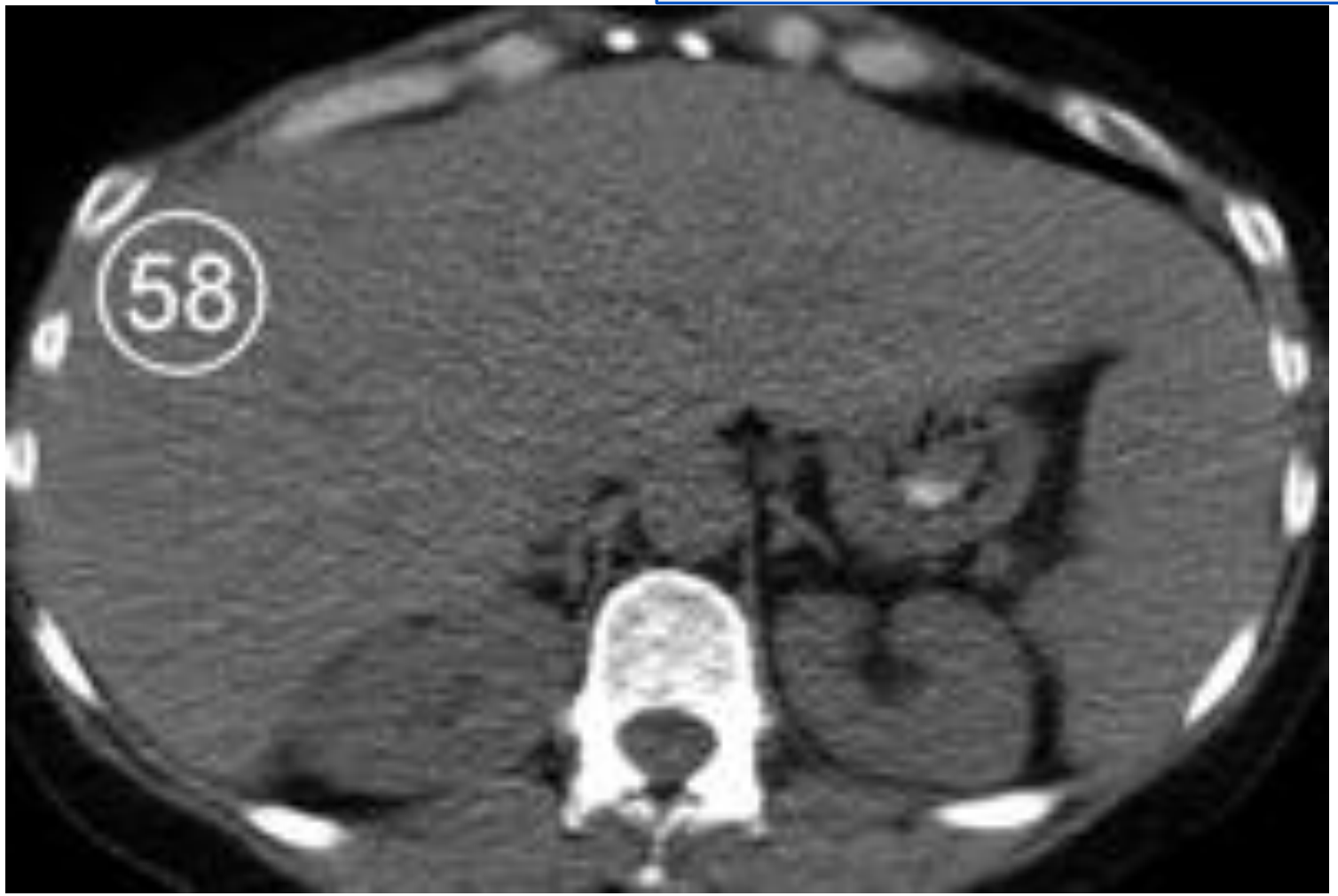
- Mention the section , body area
- Contrasted vs non contrasted
- The side for any paired organ

Hounsfield scale for densities

Absolute positive: BONE +1000
Contrast: 150
Soft tissue: 40-60
Neutral: FLUID 0
Fat: -20-30
Absolute negative: GAS - 1000




[25, 54] ave=61 std=7
[10, 46] ave=55 std=9

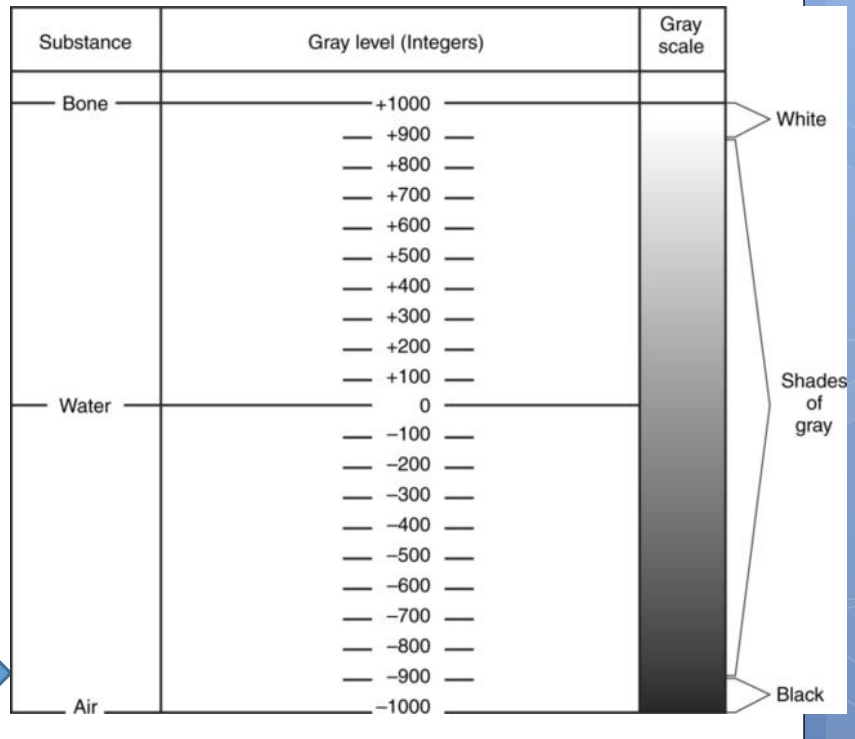


-noncontrased CT
-when to use noncontrasted image?

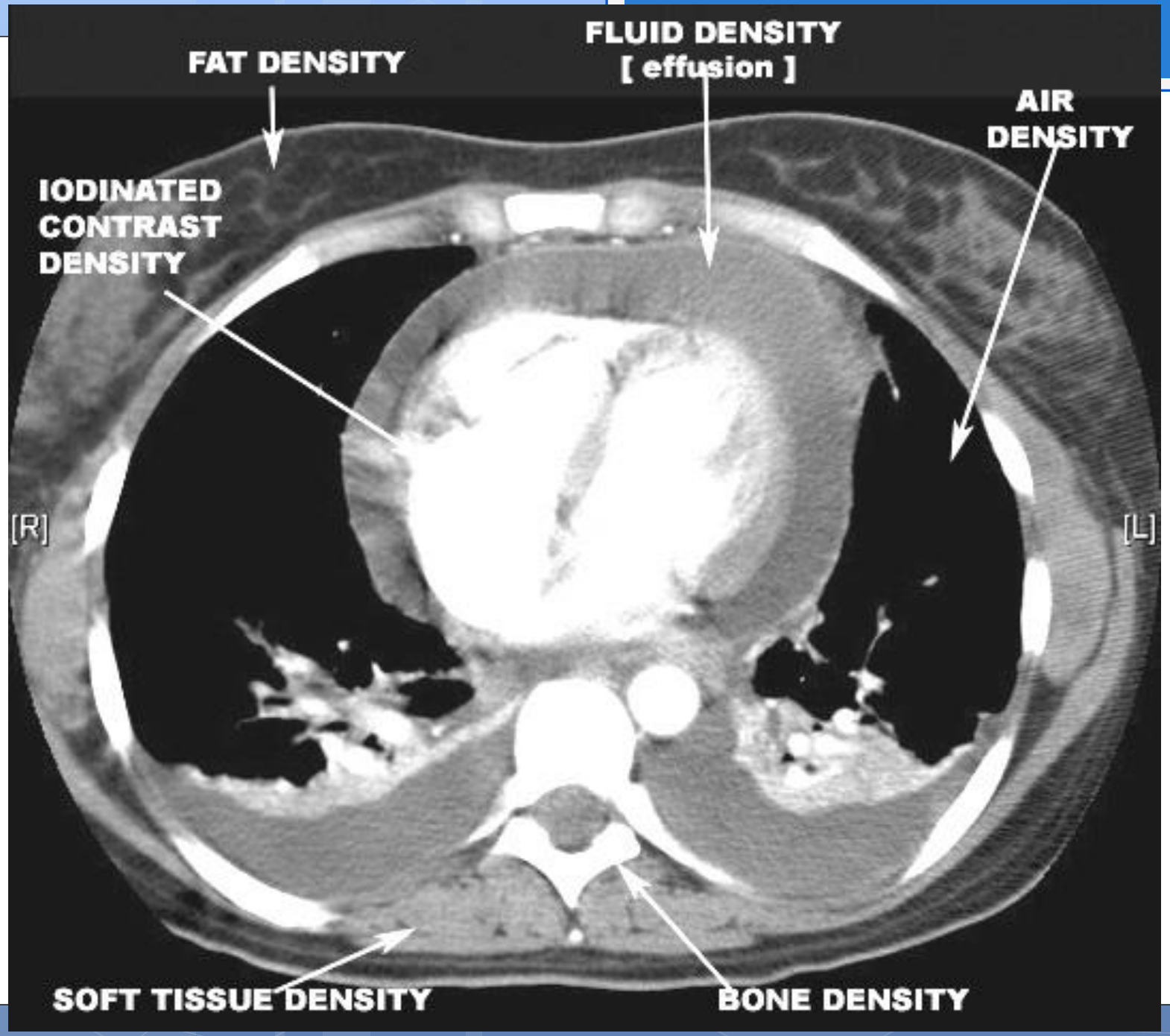
How to know its contrasted ?
Oral vs IV contrast

AGAIN…
Hounsfield scale for densities

Absolute positive: BONE +1000
Contrast: 150
Soft tissue: 40-60
Neutral: FLUID 0
Fat: -20-30
Absolute negative: GAS - 1000



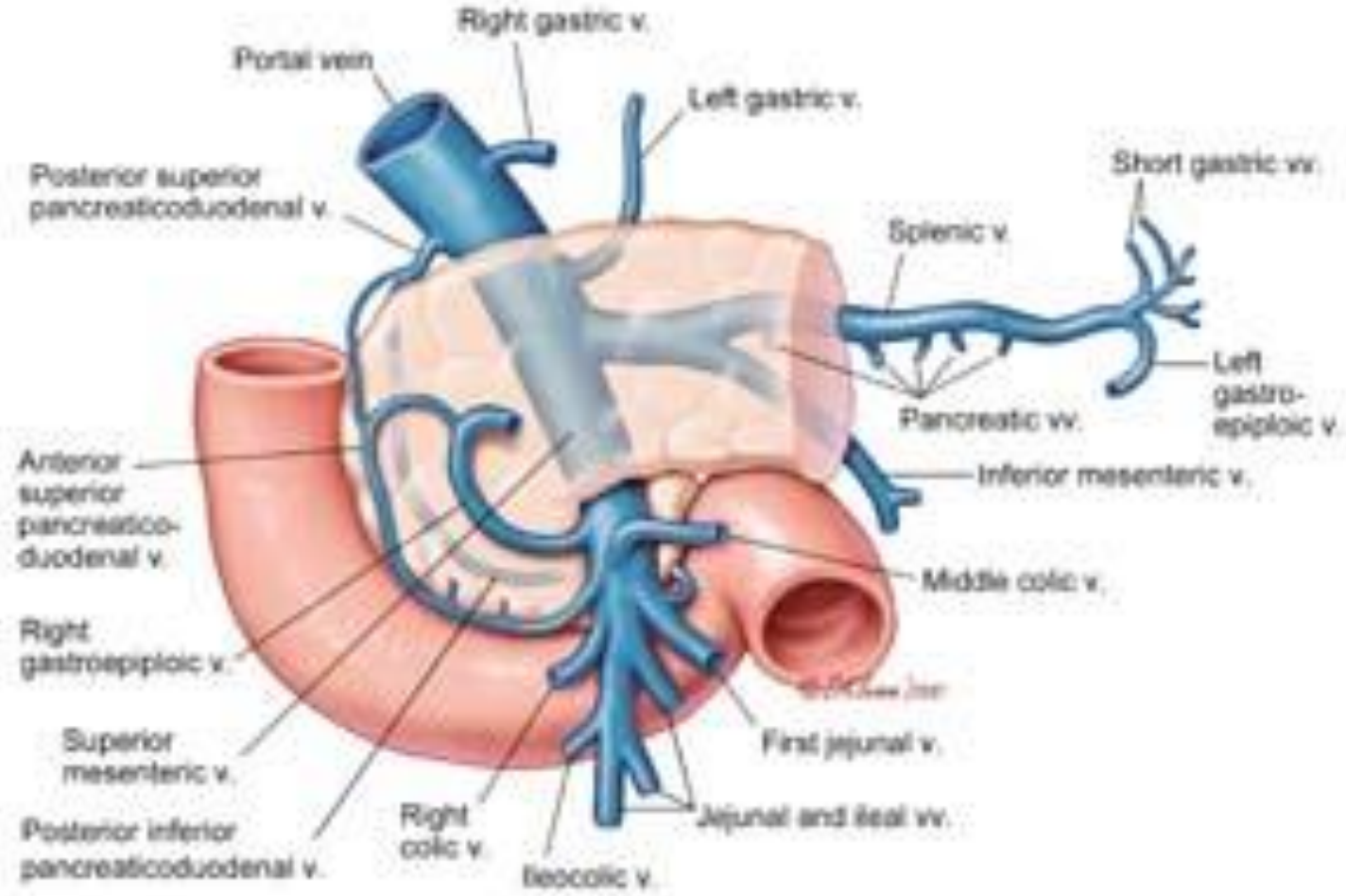
Organs of different densities



.Absolute positive: BONE +1000
.CONTRAST 150
.SOFT TISSUE 40-60
.Neutral: FLUID 0
.FAT -20-30
.Absolute negative: GAS -1000

Important organs…

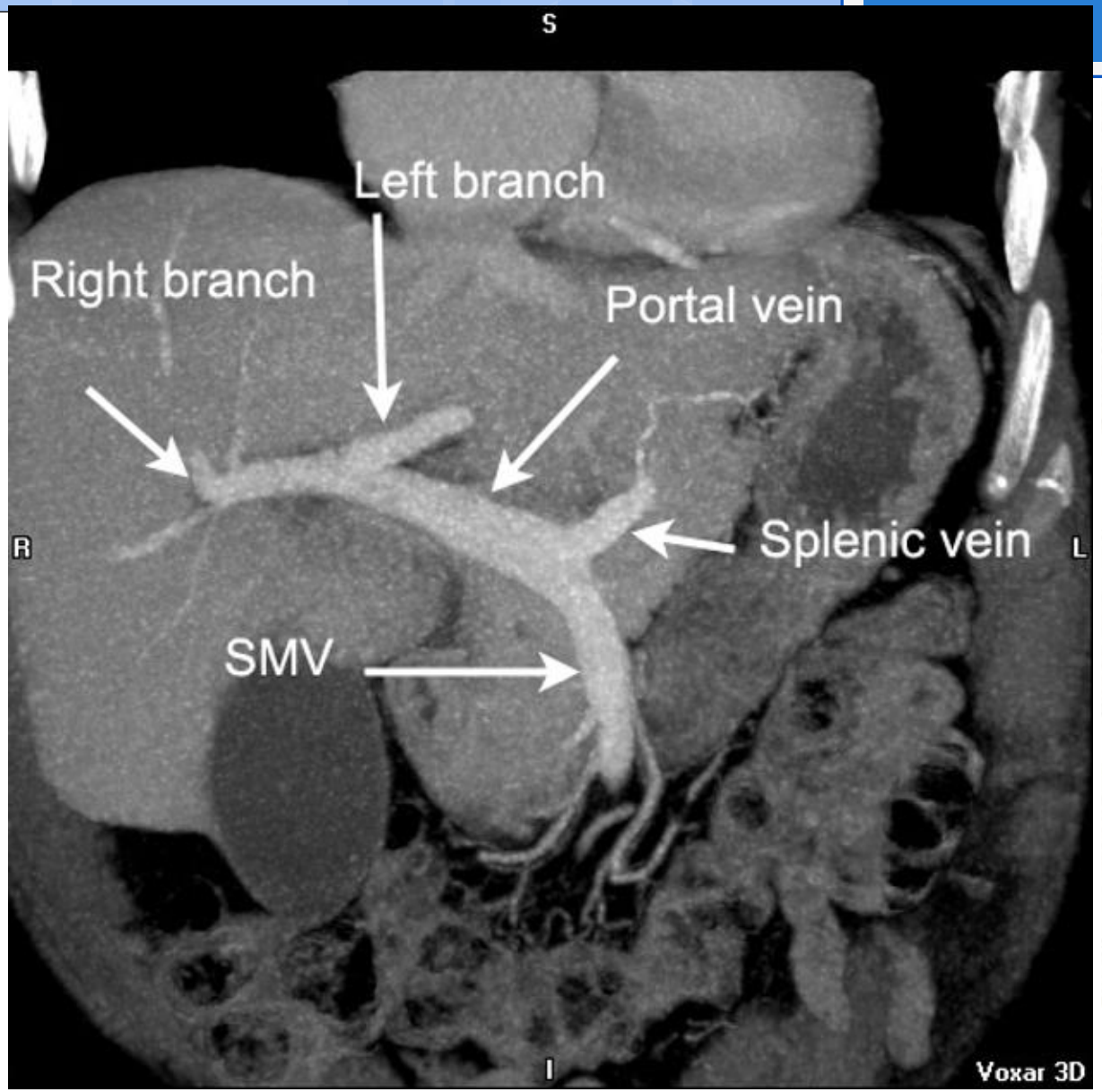
Portal vein

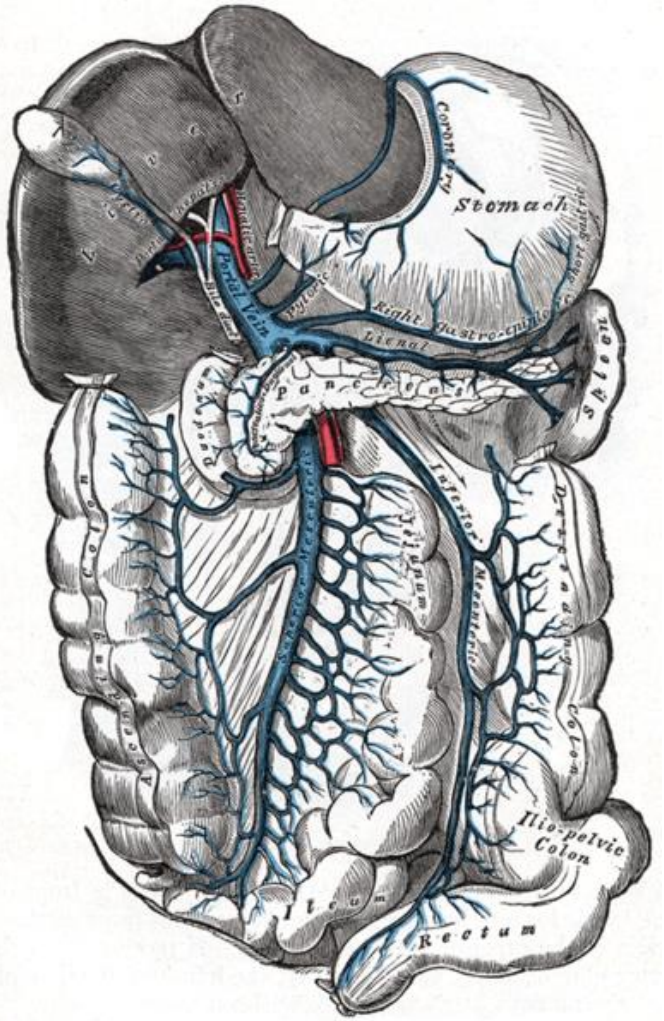


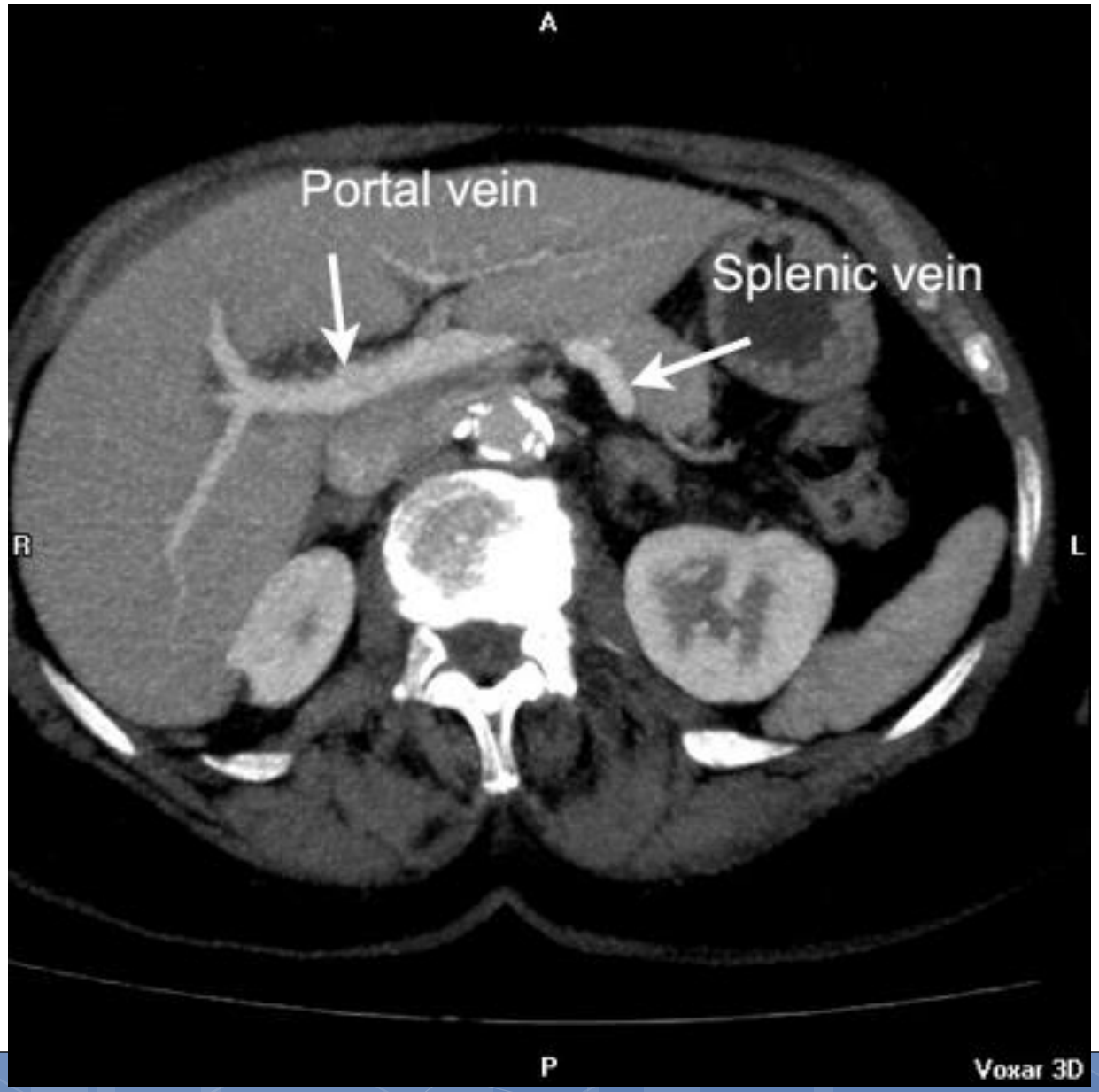
BEHIND THE NECK OF PANCREAS.

Lateral to the portal vein: head of pancreas.

Lateral to head of pancreas: second part of duodenum


S
Left branch
Right branch
Portal vein
Splenic vein
SMV
R
L
I
Voxar 3D


Stomach
Spleen
Ileo-pelvic Colon
Rectum

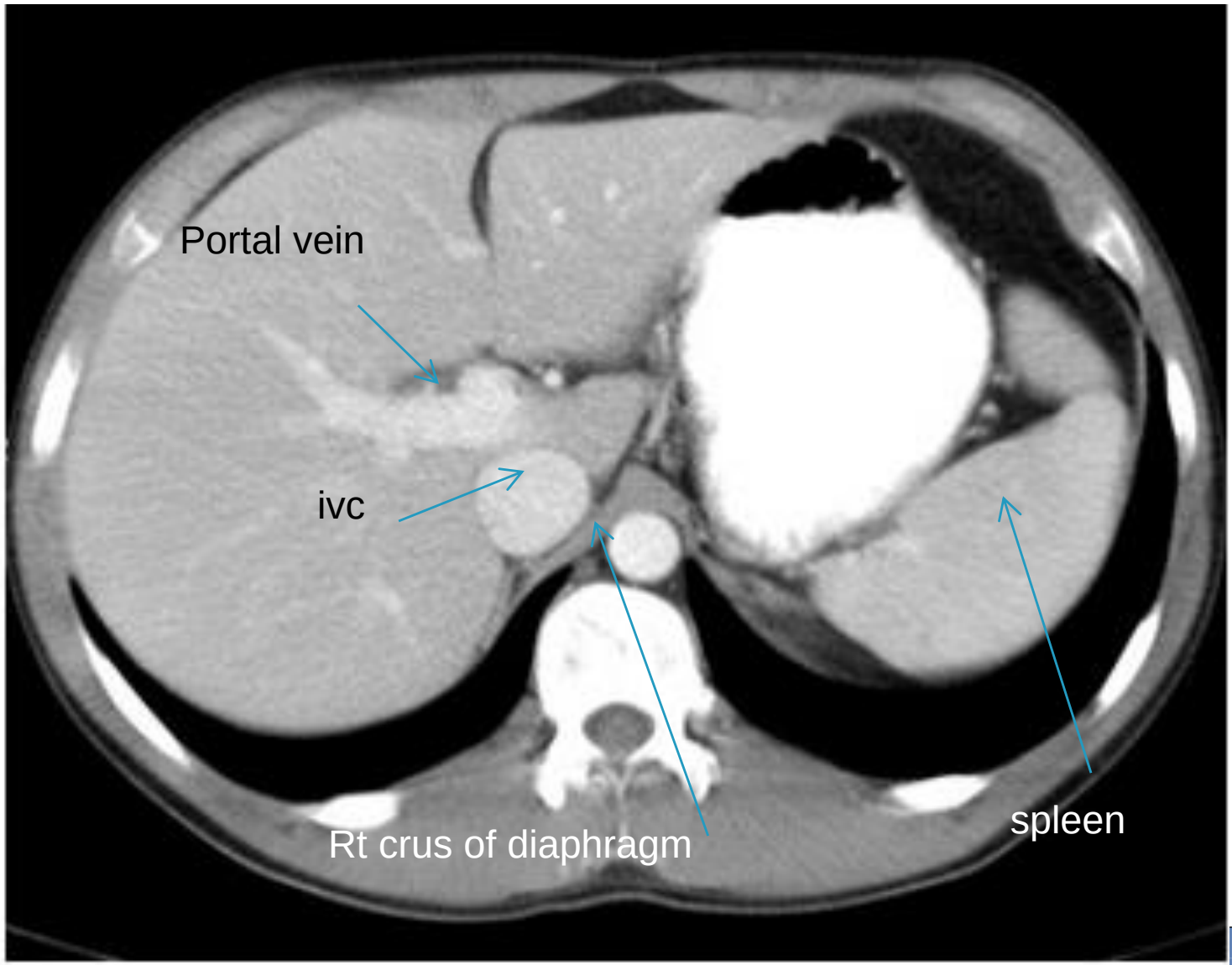


Pancreas

THE SPLENIC VEIN IS POSTERIOR TO THE BODY OF THE PANCREAS.

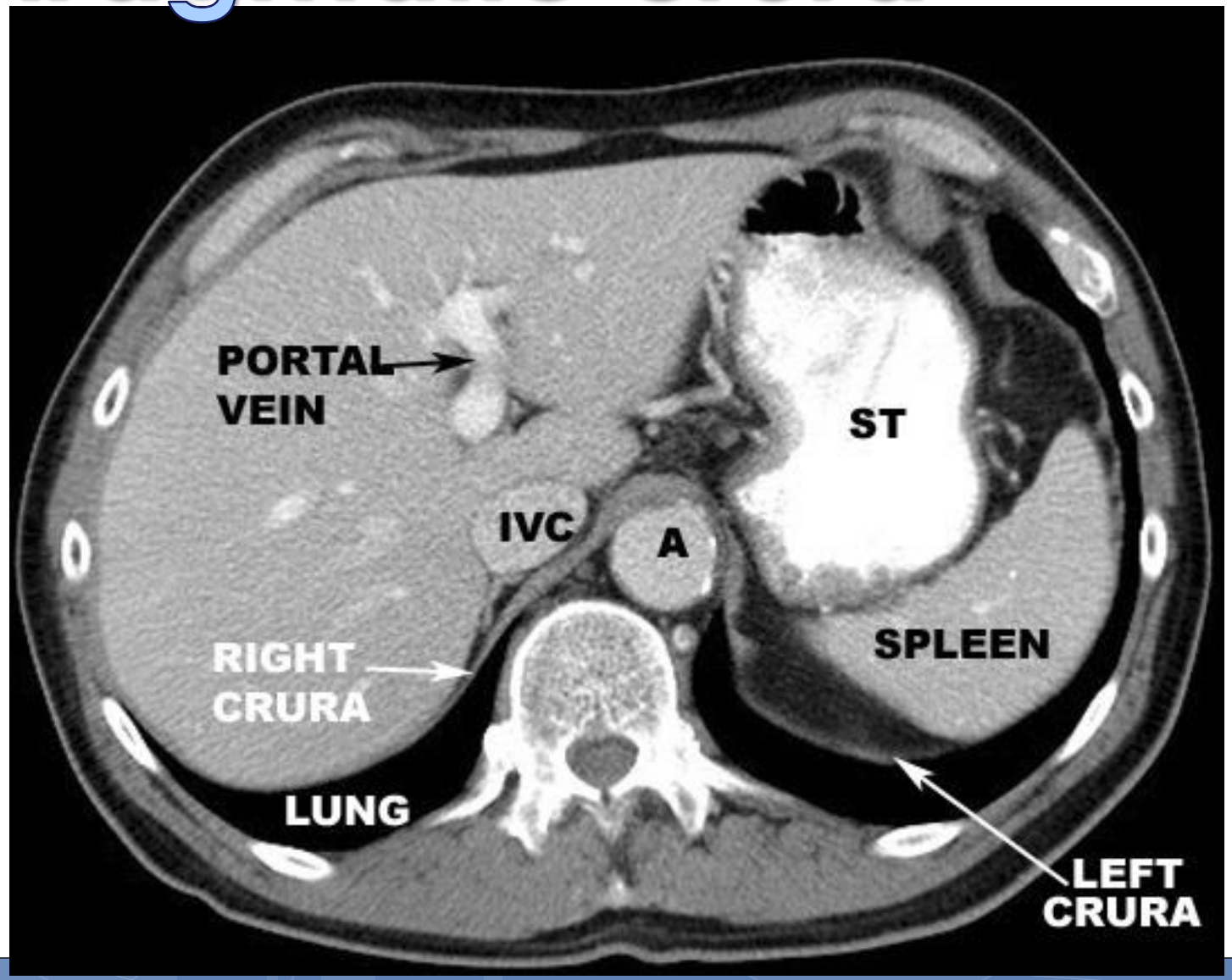
Liver … caudate lobe

-Portal vs hepatic



THE CAUDATE LOBE LIES ANT TO THE IVC , AND POST TO THE FISSURE OF LIGAMENTUM VENUSUM.

Diaphragmatic crura



AORTA JUST ANT TO VERTEBRAE.

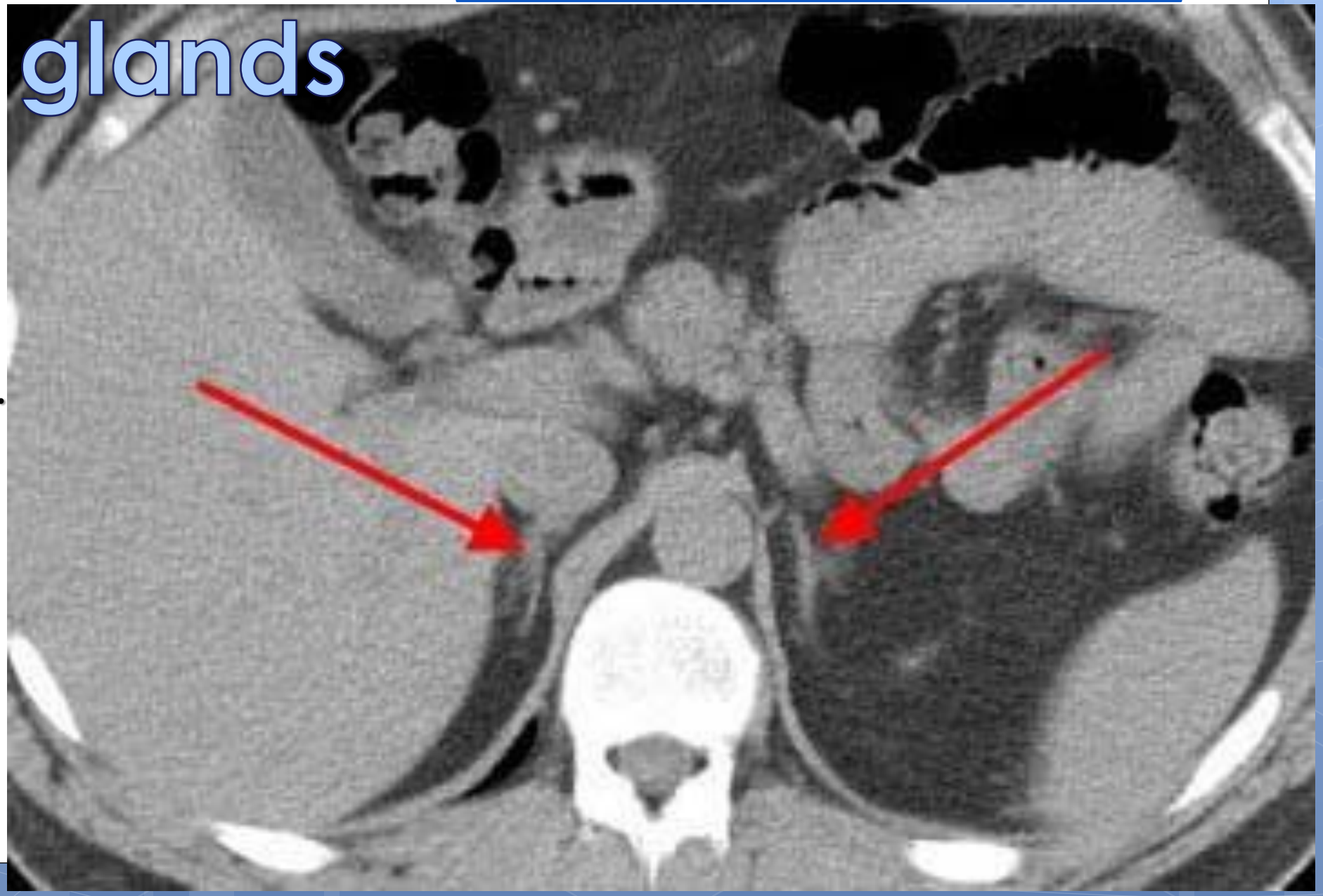
Adrenal glands

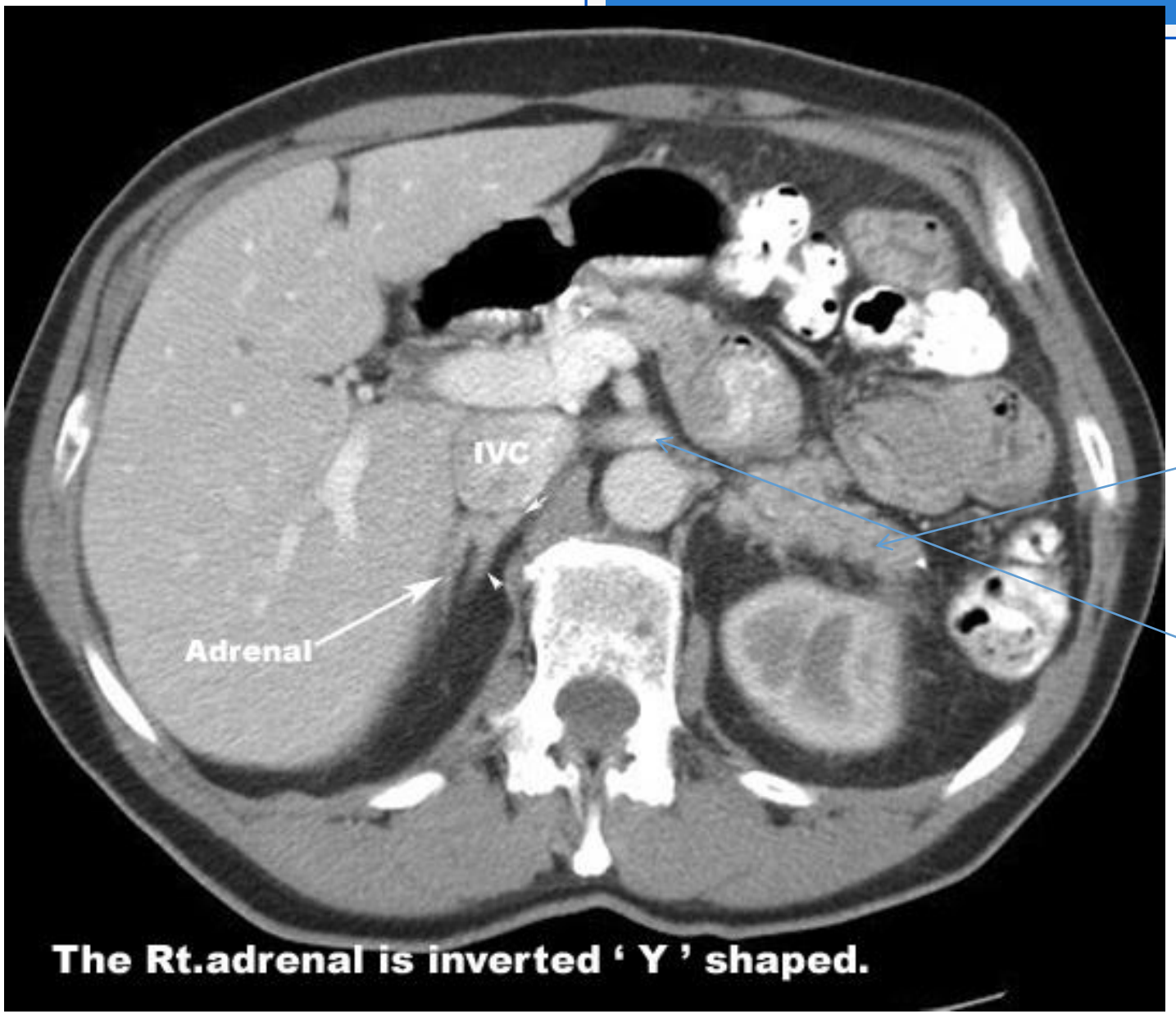
-Hat shaped, inverted Y shaped.

-Rt and Lt adrenals.

-Rt is superior to rt kidney.

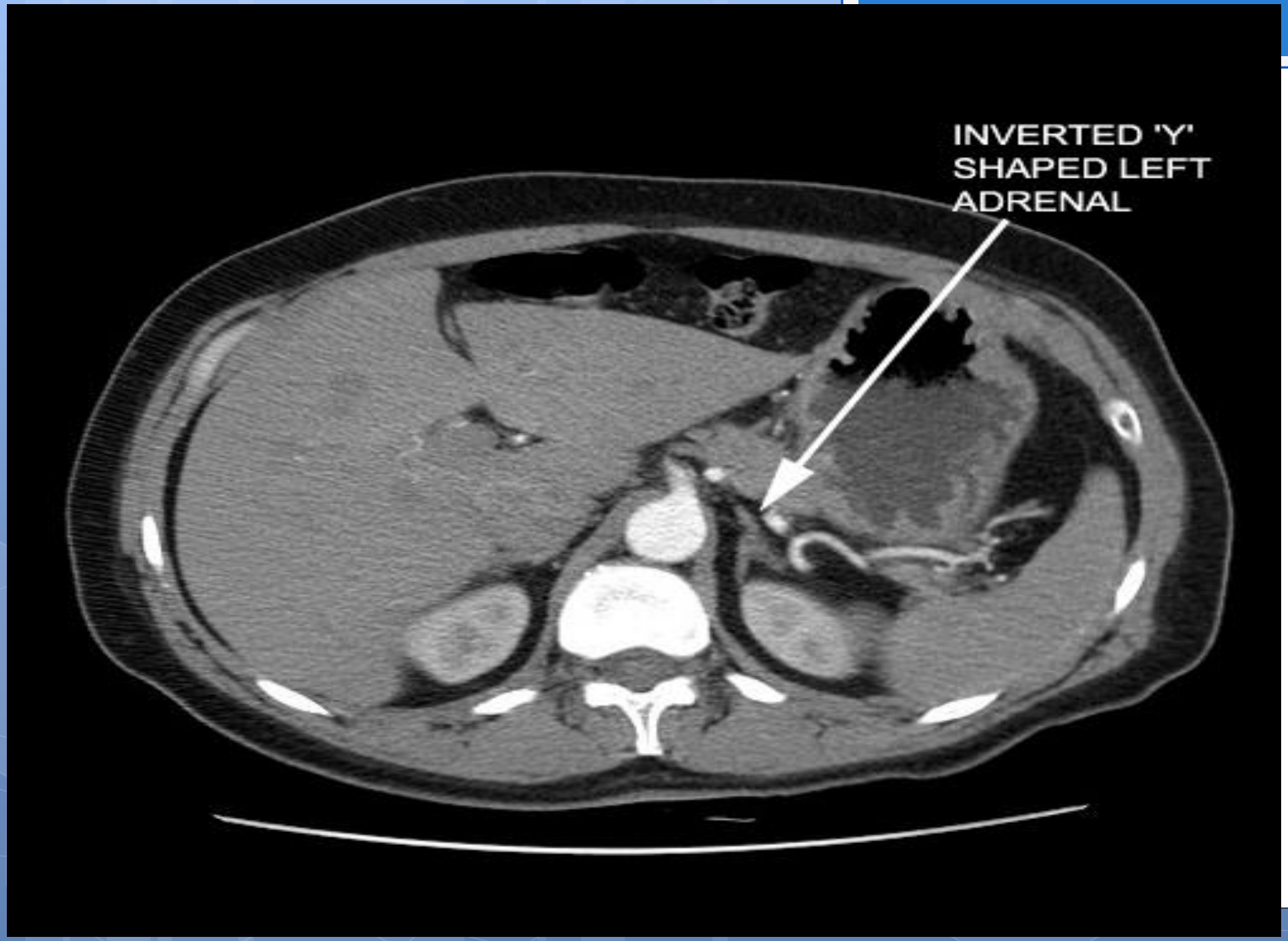
-It is anterior to the upper pole of lt kidney.





Tail of pancreas

Left renal vein



Splenic artery= tortious + contrast density+ from aorta to spleen + above pancreas

Important vessels

3 single branches of the abdominal aorta:

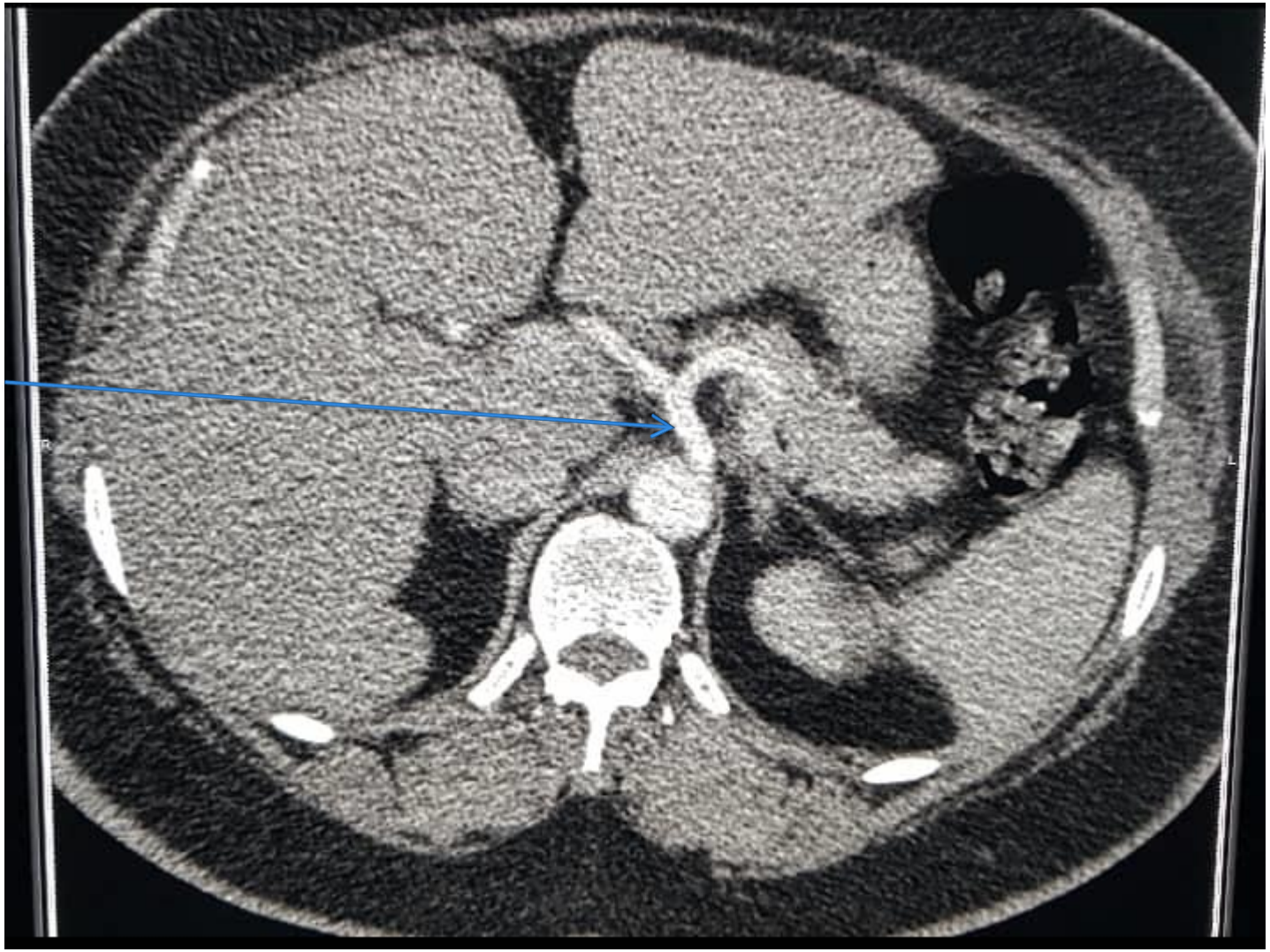
- Celiac trunk (T12,L1): LEFT GASTRIC, COMMON HEPATIC, SPLENIC

- SMA (L1)

- IMA (L3)

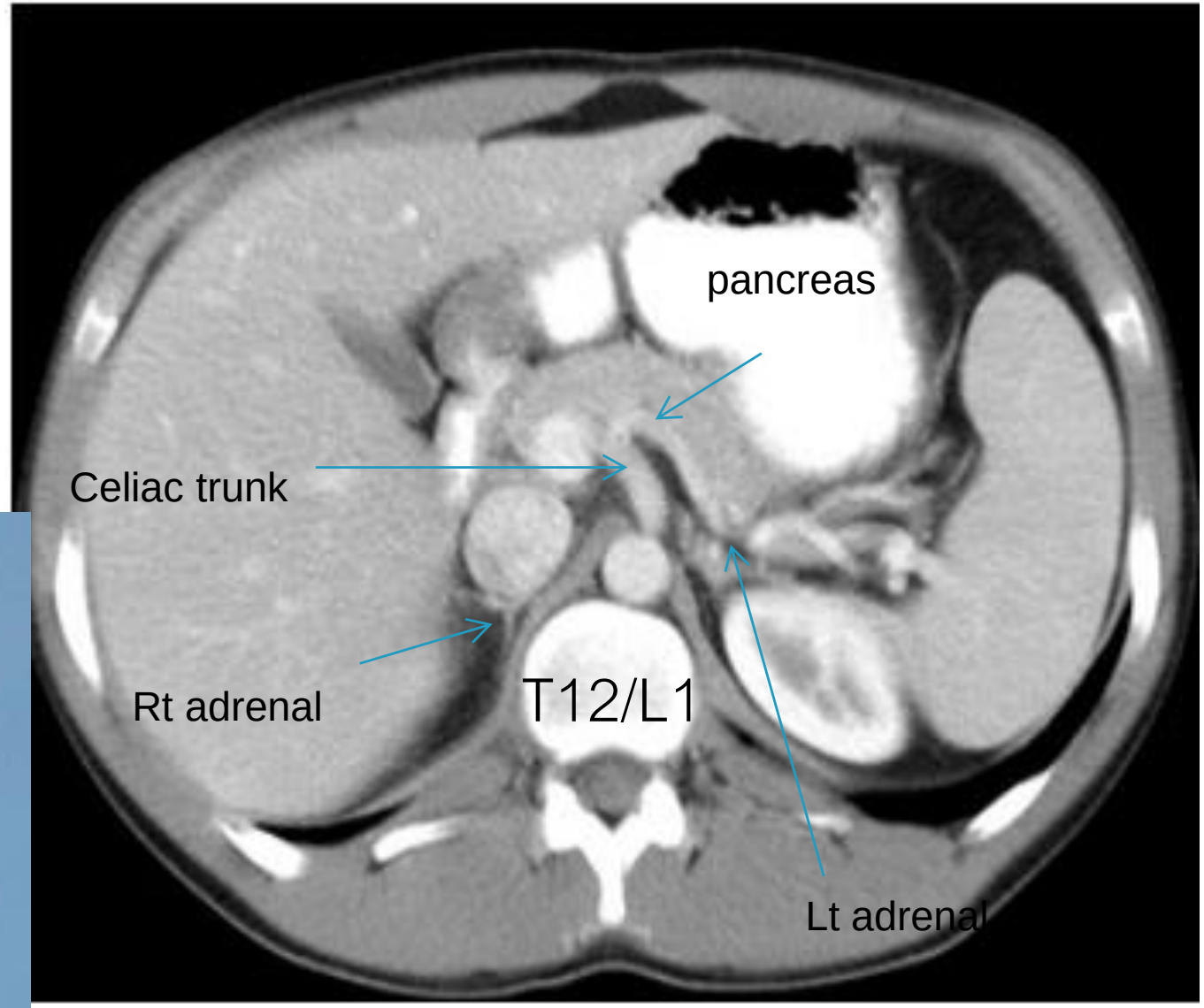
Celiac

Celiac trunk



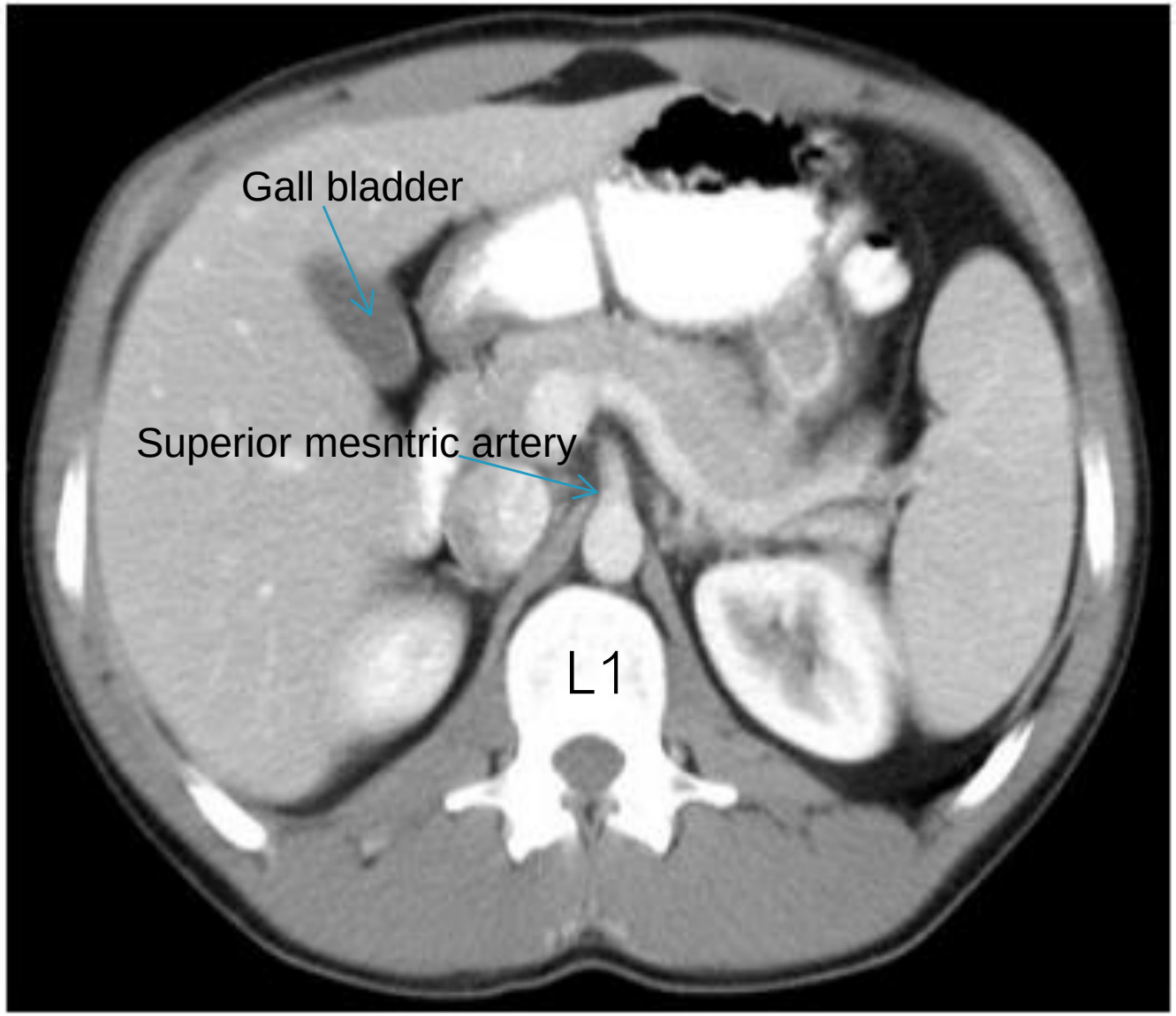
Seagull sign

Celiac



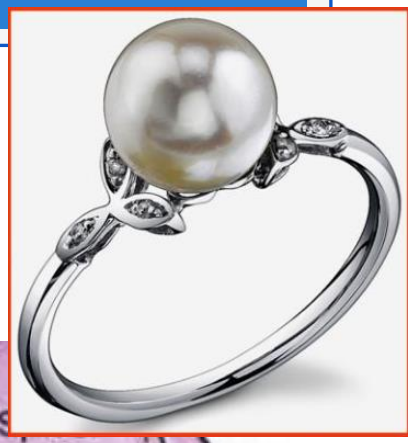
Seagull sign

SMA



- **LOOK AT THE LEVEL**
- **SEAGULL SIGN**
- **THE CONFLUENCE/THE SMV / SPLEENIC VEIN THIS IS SMA LEVEL.**

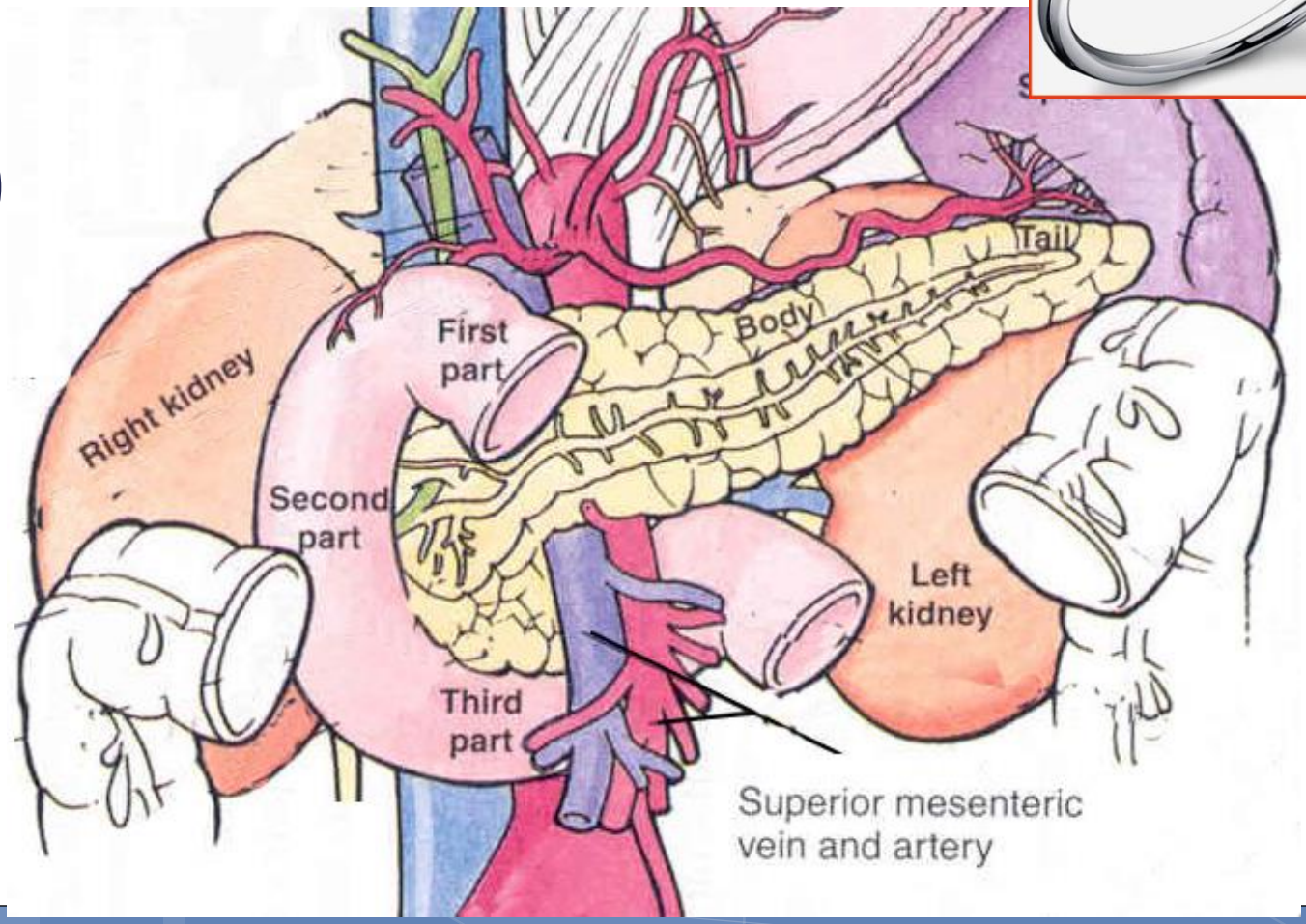
Signet ring sign

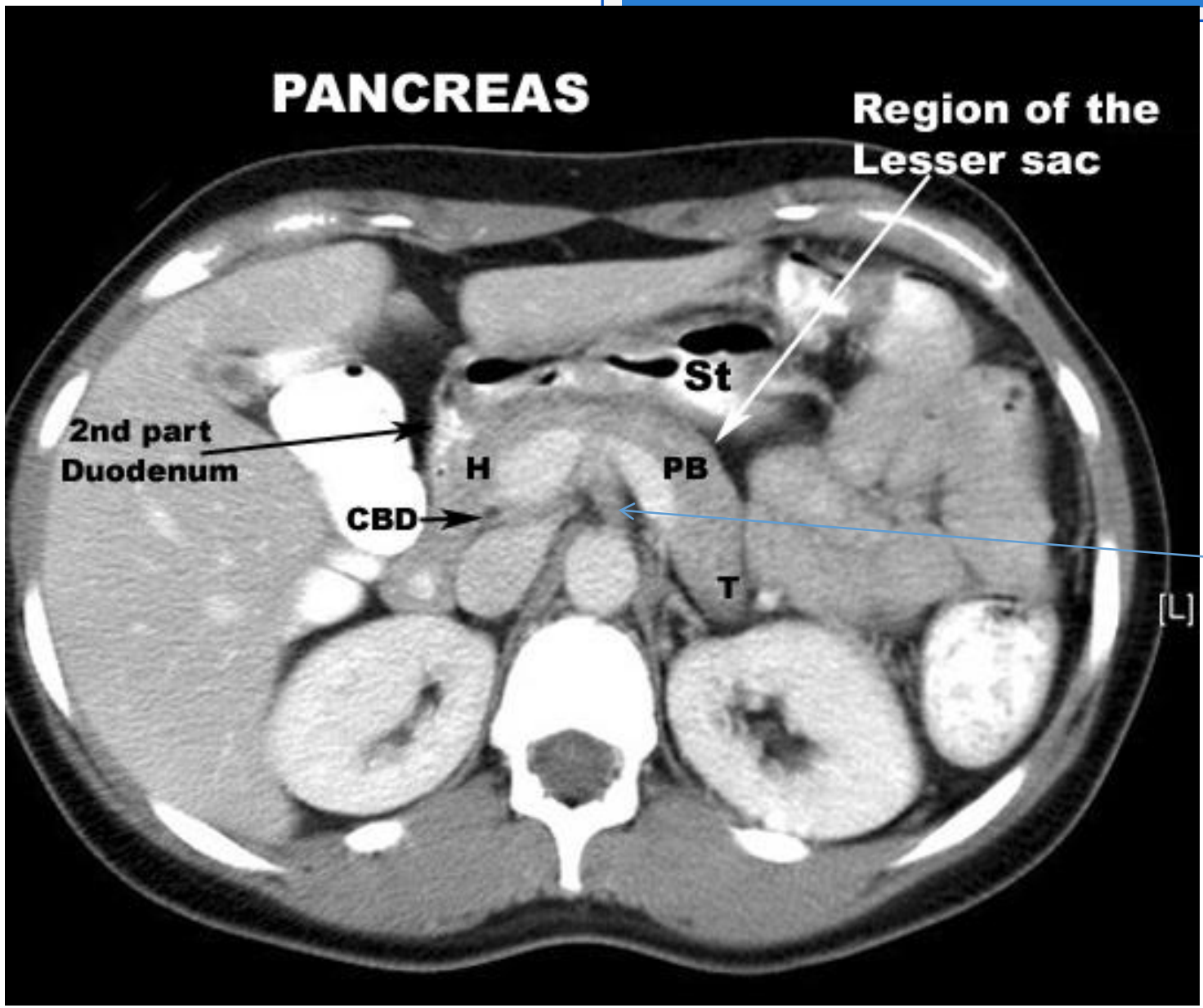


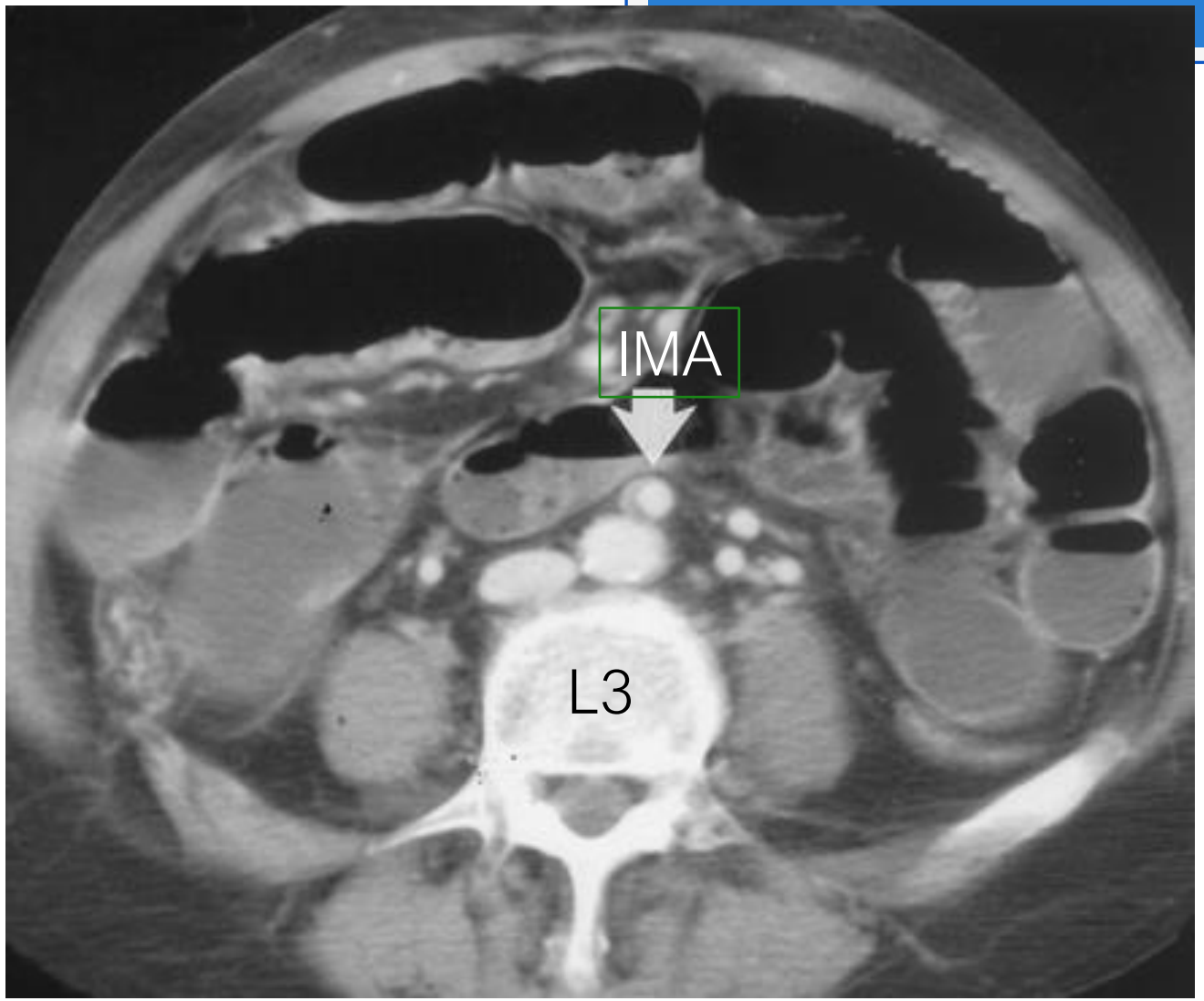
SM vessels :

head of pancreas(ant)
uncinate process(post)
2nd part of deudenum(lat)

Vein to the right



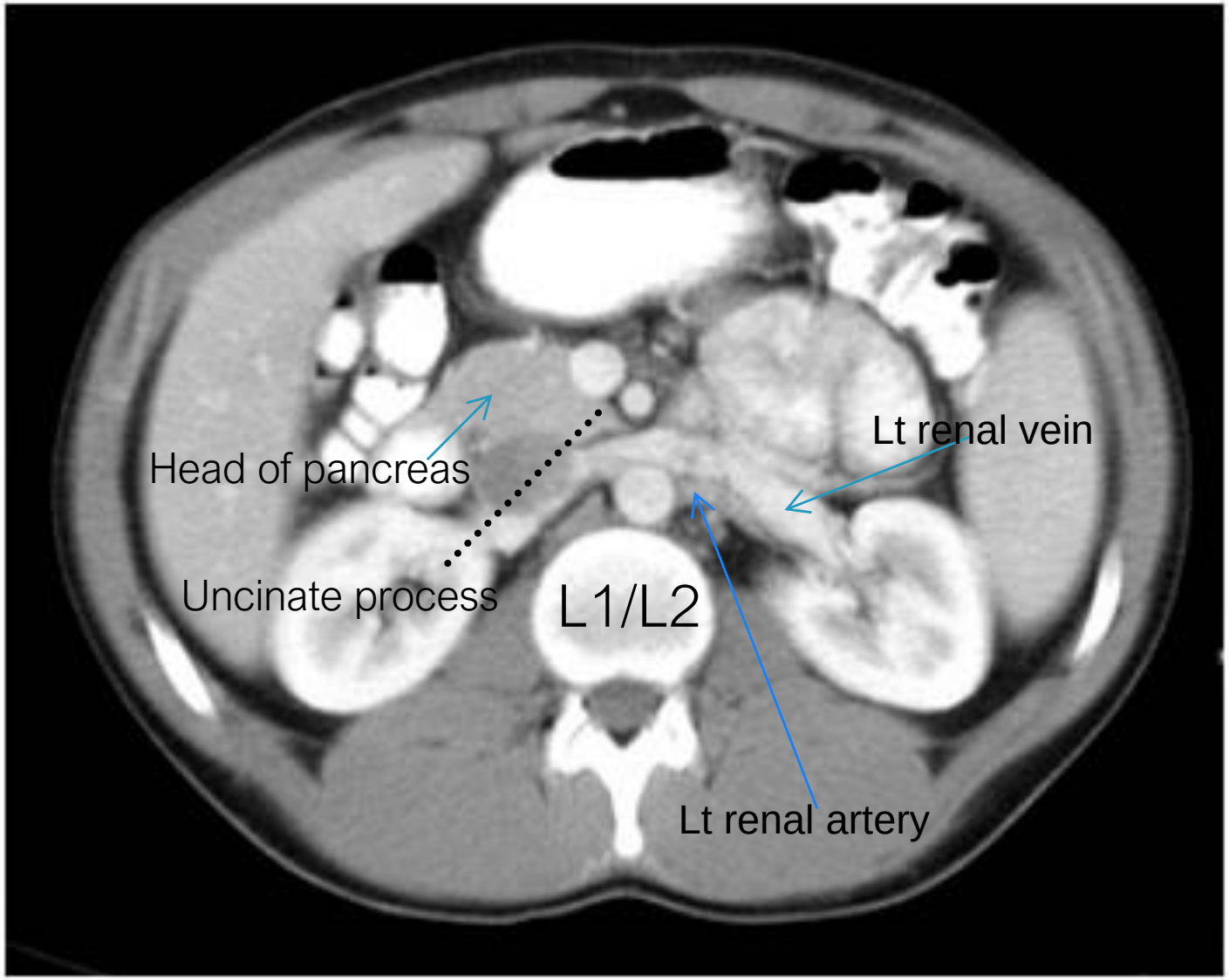

PANCREAS
Region of the
Lesser sac
St
2nd part
Duodenum
H
PB
CBD
T
[L]
SMA



IMA:
Going to left with all its branches.

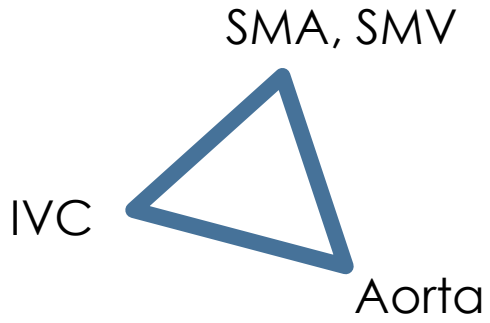
Diffuse small-bowel ischemia in 60-year-old man with occlusive mesenteric ischemia. Axial CT scan obtained at level of inferior mesenteric artery (arrow) shows large caliber of this vessel. Long segment of small-bowel dilatation has minimal wall thickness of 1-2 mm.

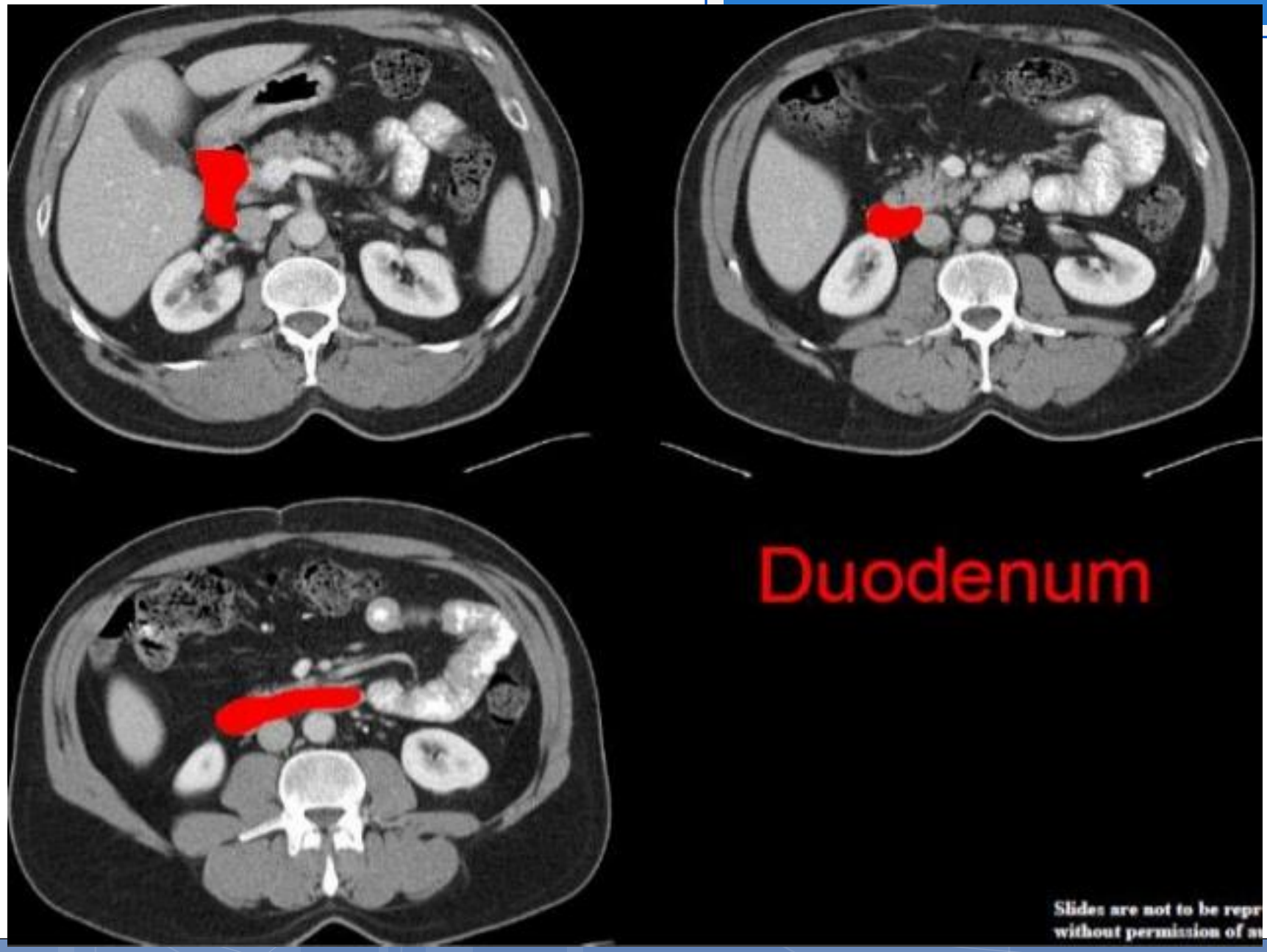
Vascular triangle



BEHIND SM VESSELS:

1. **Uncinate process**
2. **3rd part of deudenum**
3. **LEFT Renal vein**




Duodenum
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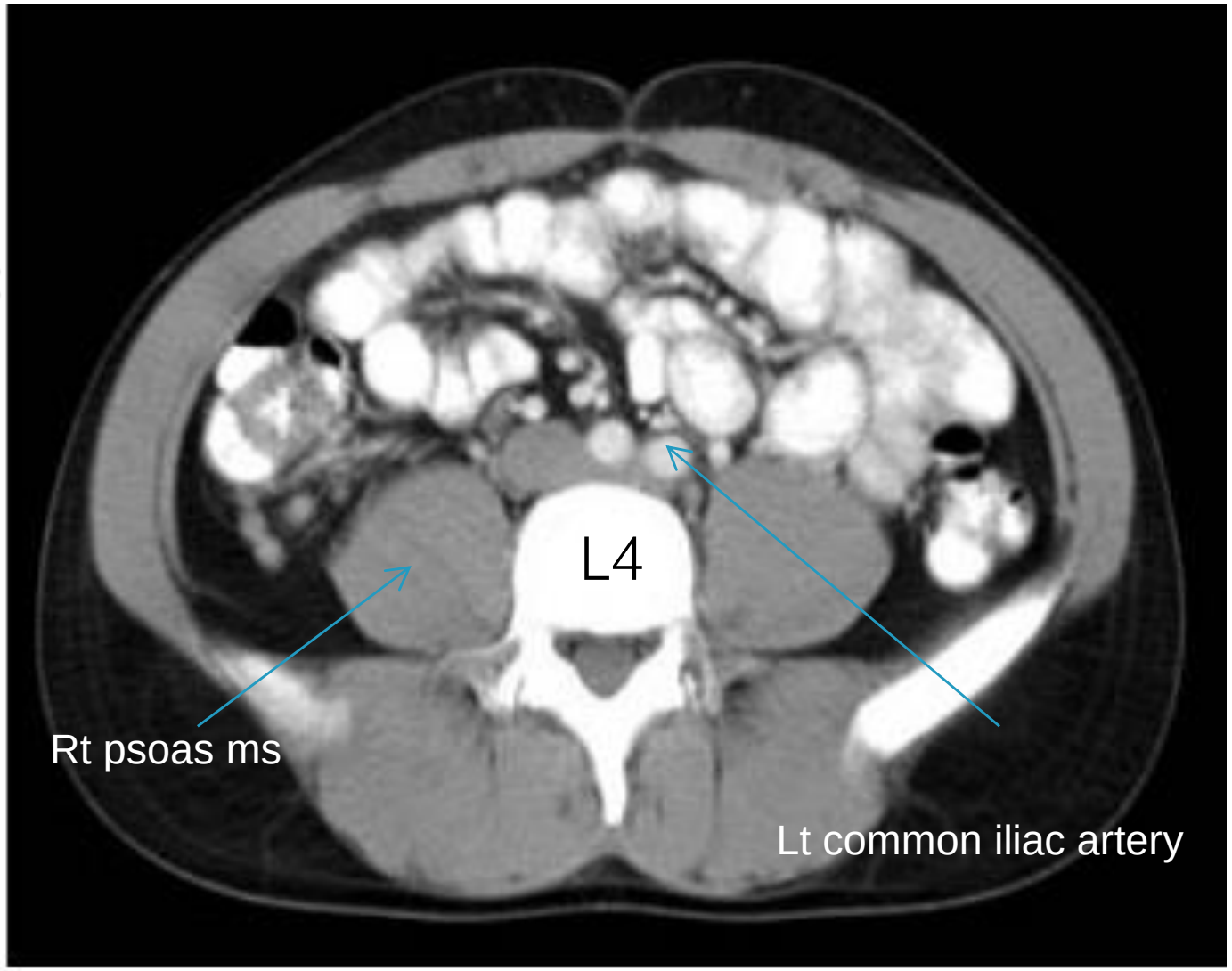
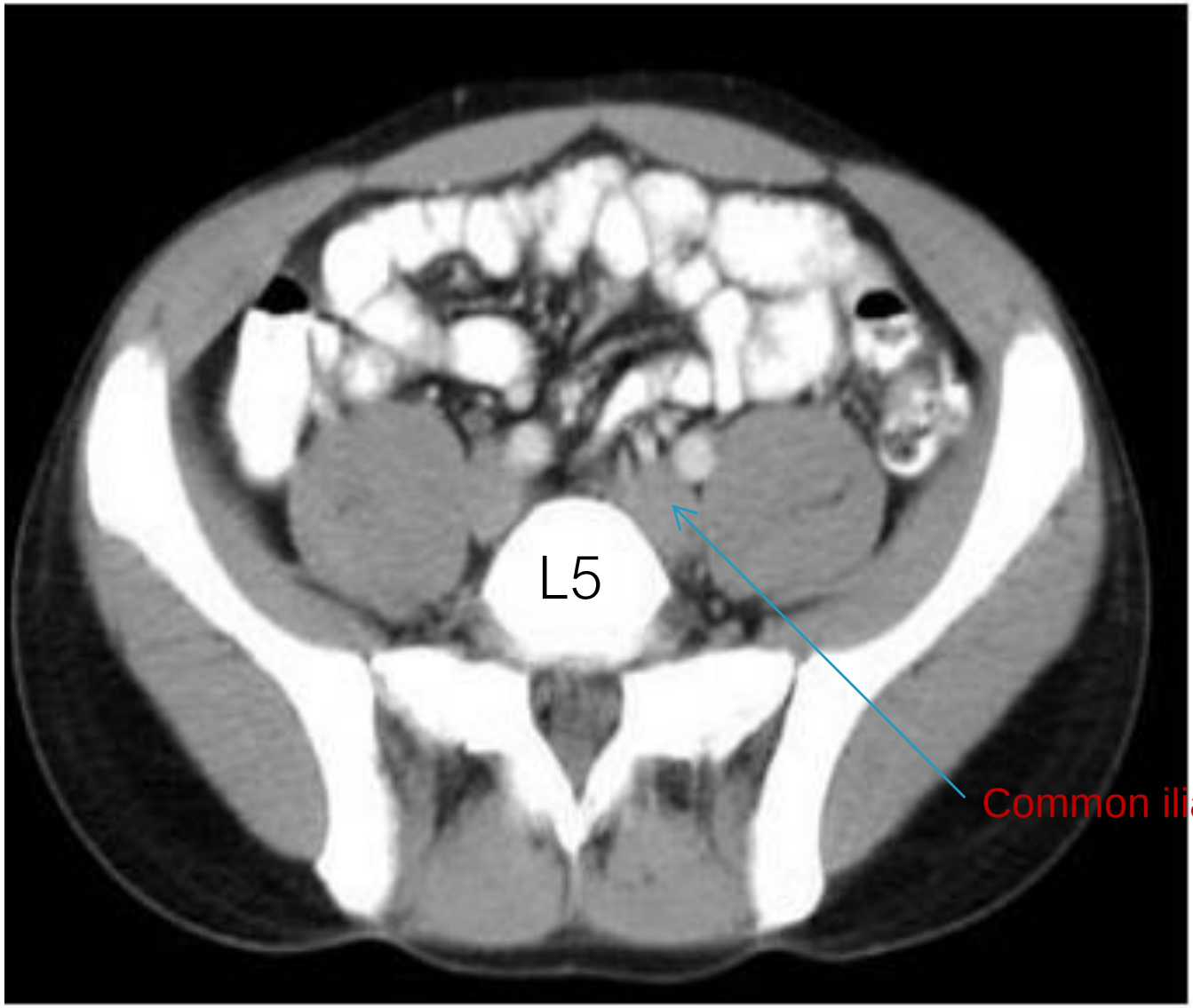
3 vessels at the level of L4:
IVC
Right and left common iliac artery



3 vessels

- **4 vessels at the level of L5 : 2 arteries and 2 veins**
- **Pelvic veins are post. To the arteries.**

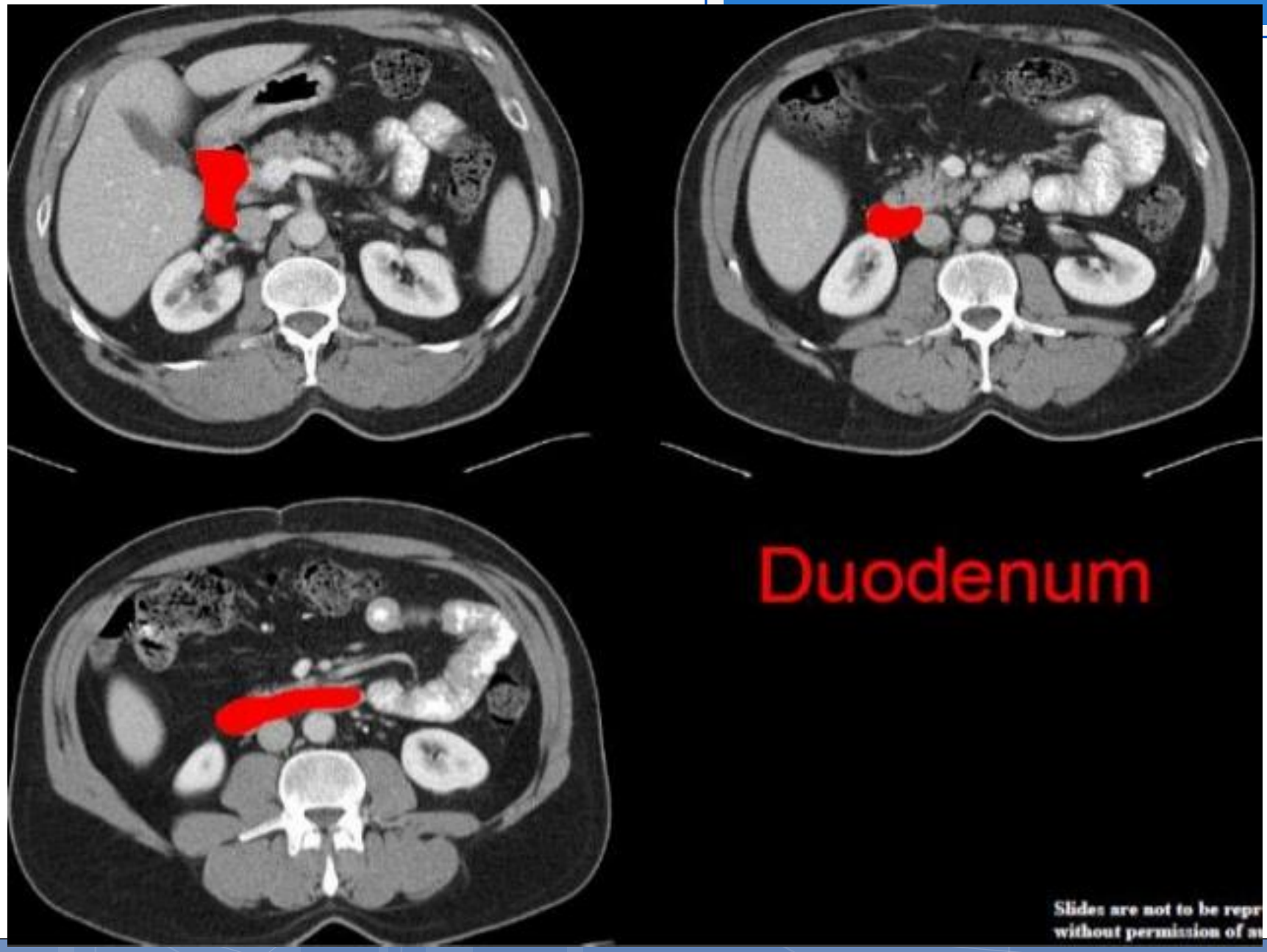


Artery is Anterior

Small and large bowel

Small bowel : central , fluid content (succus enetricus)

Large bowel : peripheral , feces and gas.


Duodenum
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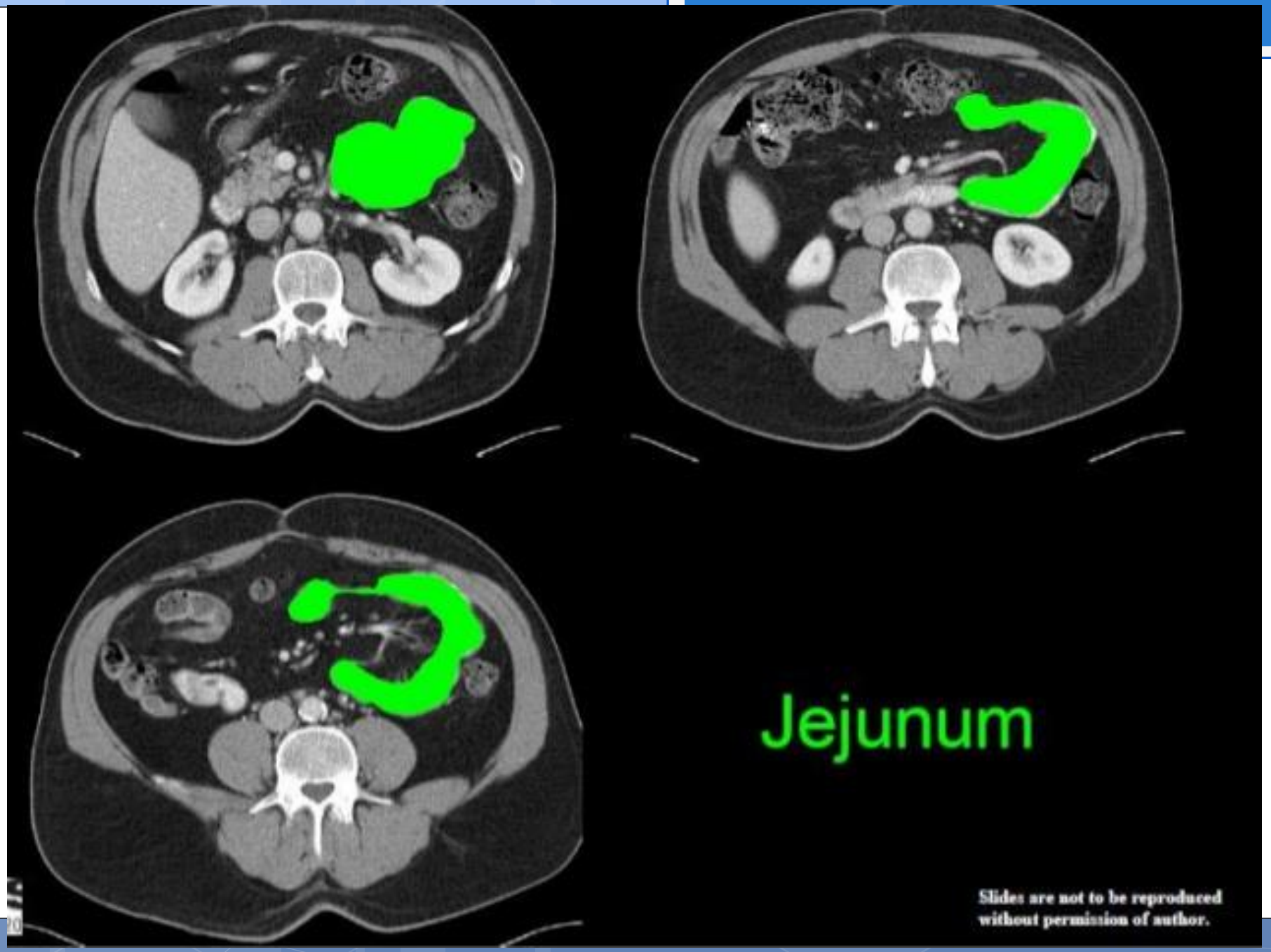
Jejunum
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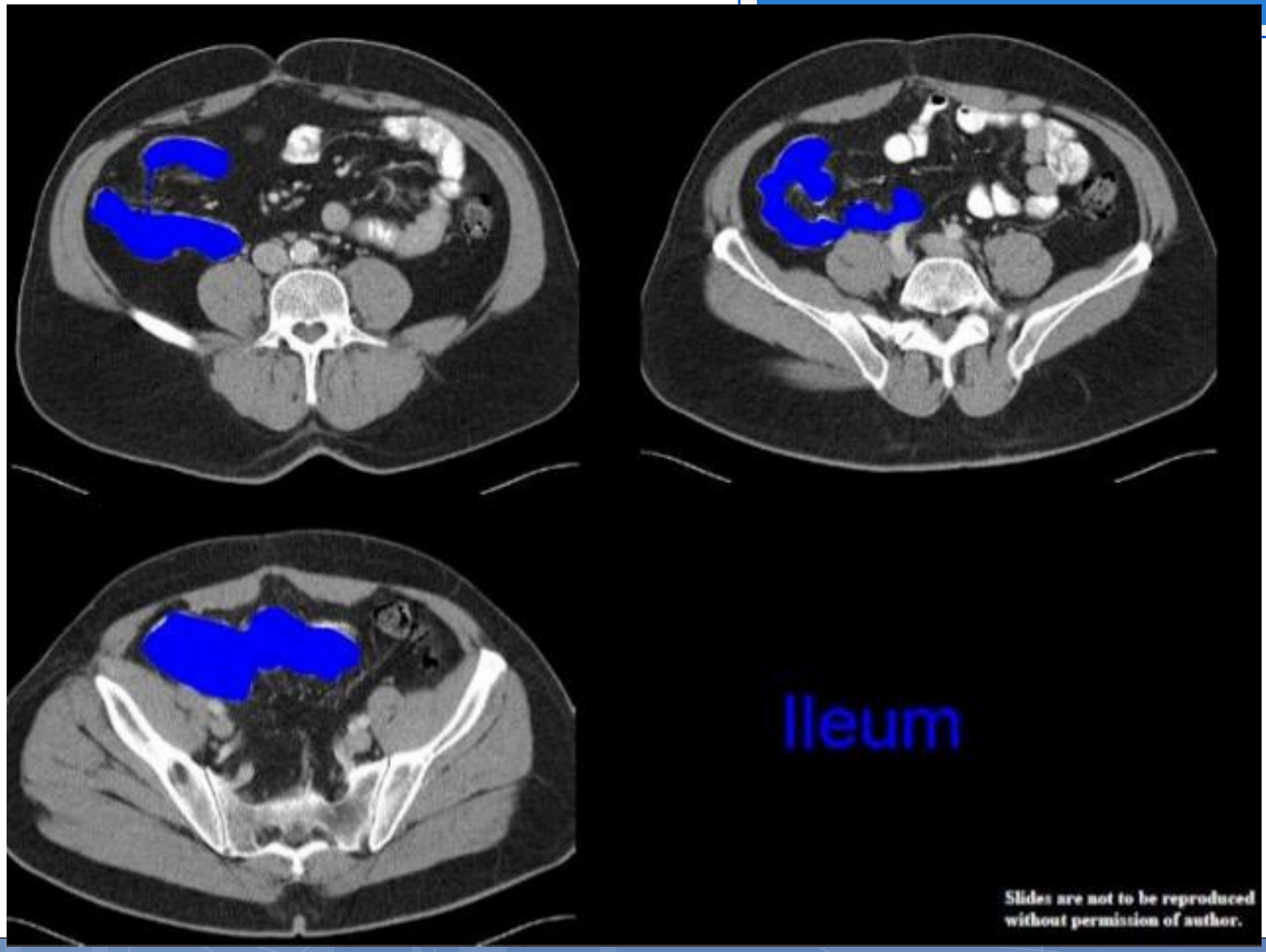
Ileum
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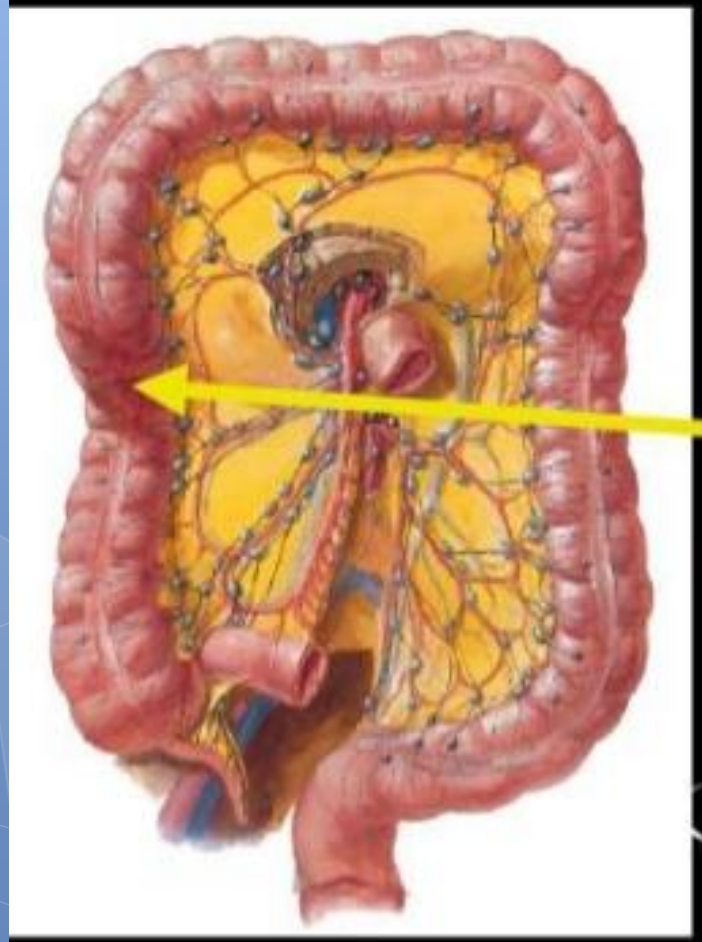
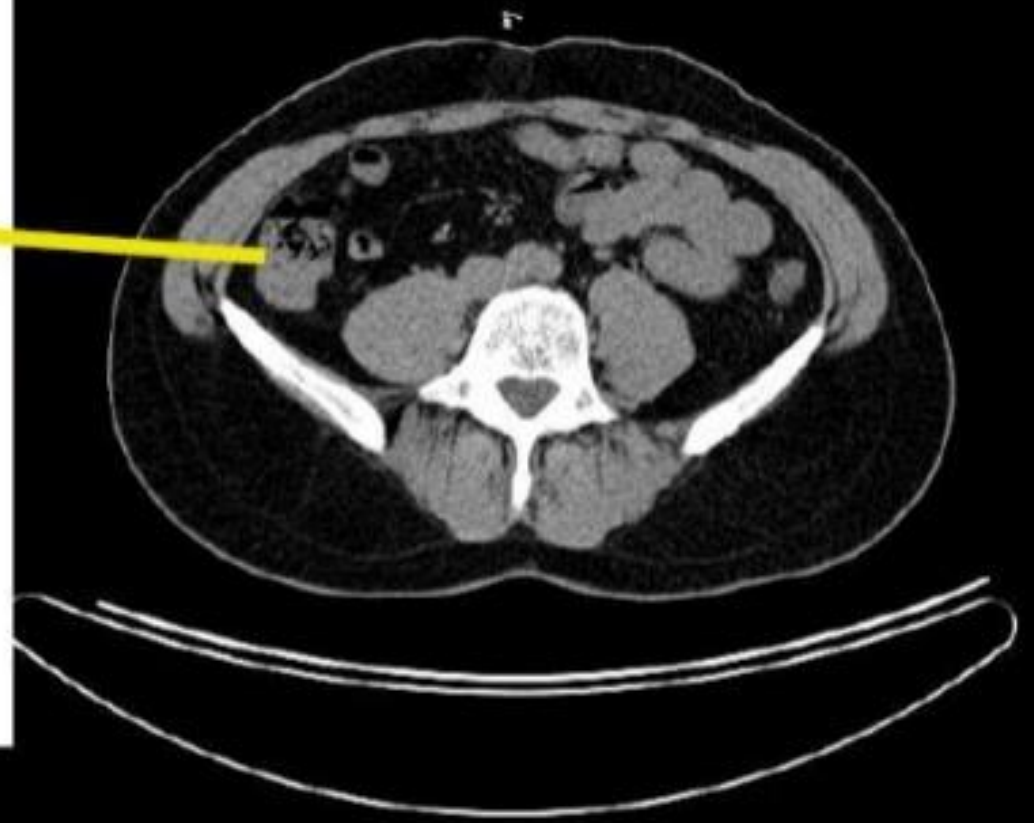
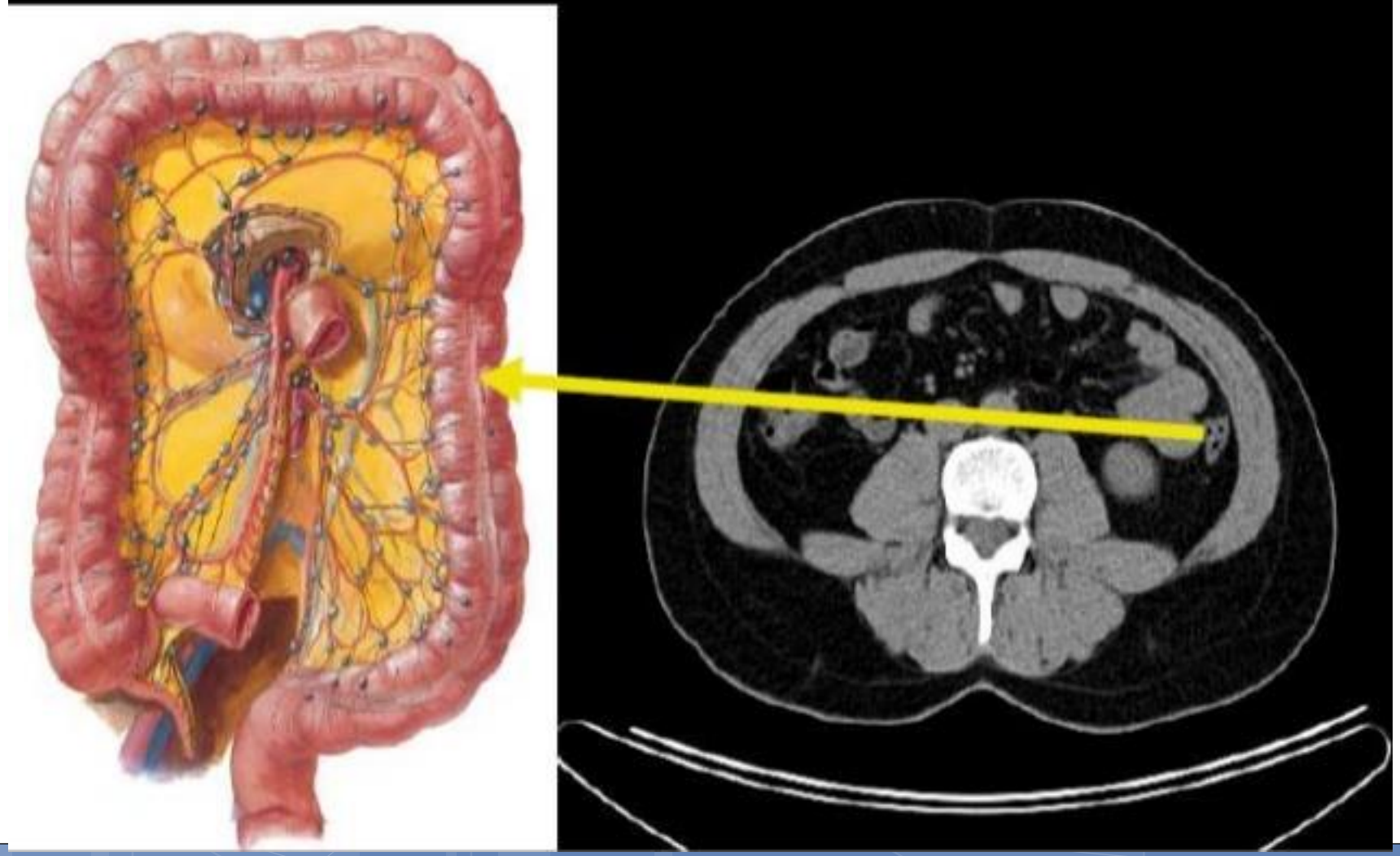
Ascending Colon





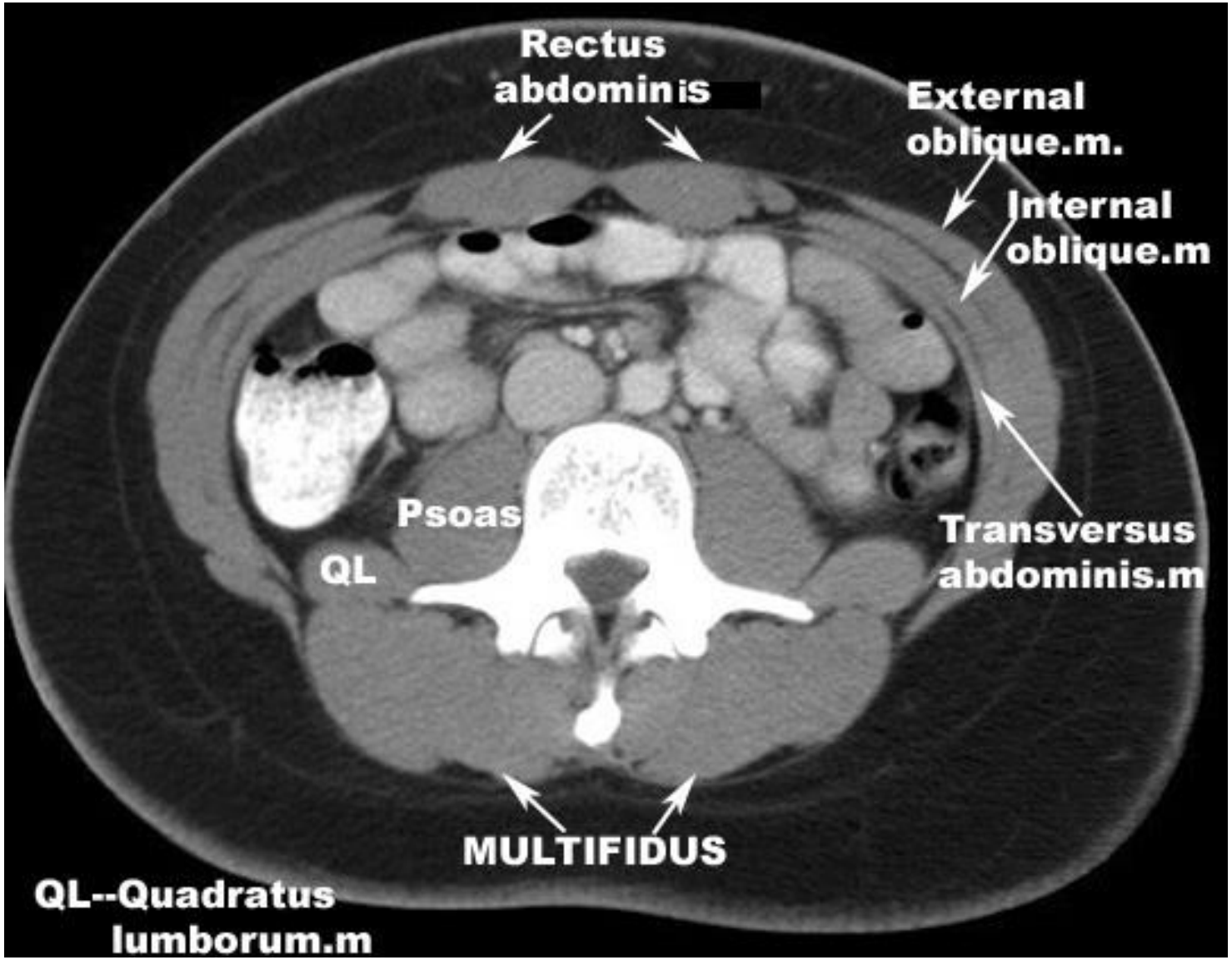
SNM
2008 Annual Meeting

Descending Colon

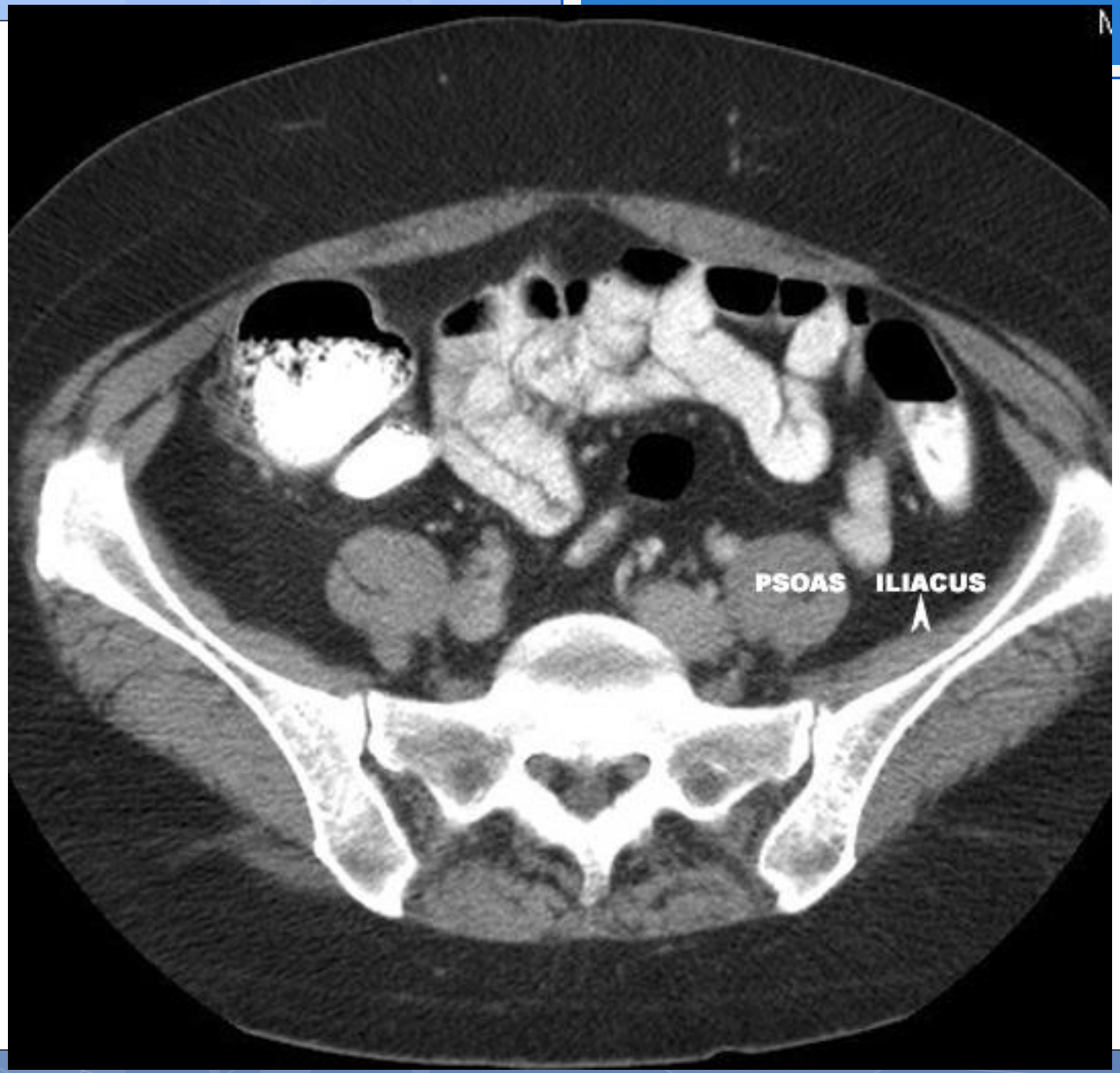


Abdominal muscles

Abdominal muscles

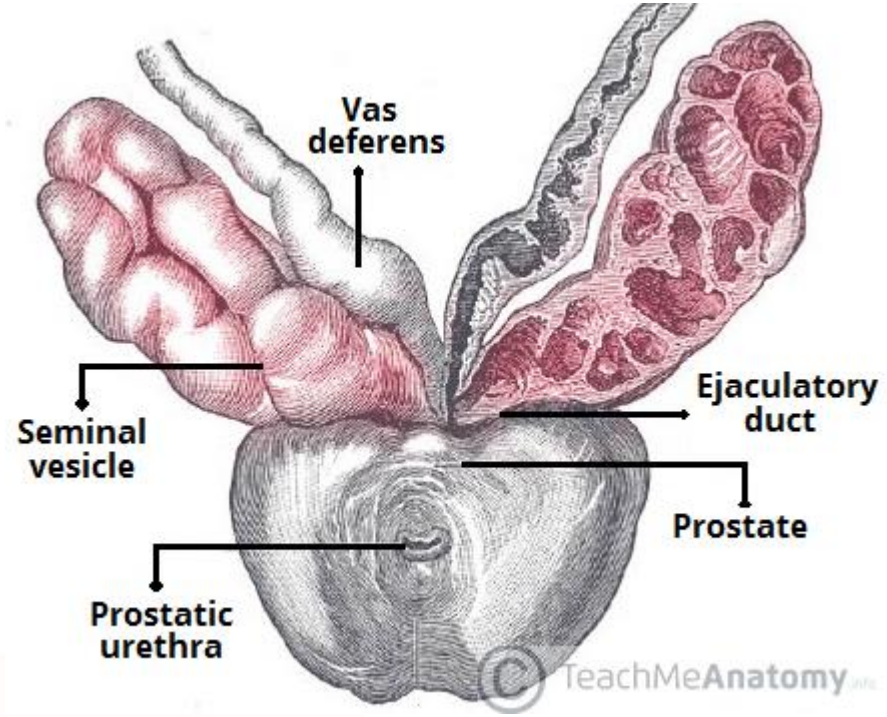


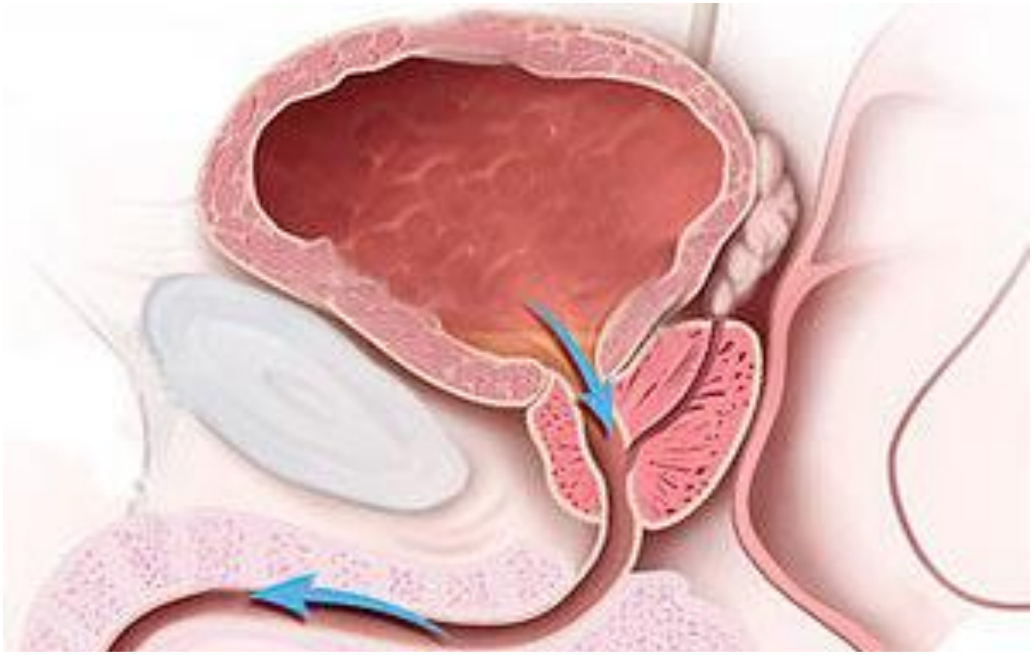
RIGHT
VS
LEFT

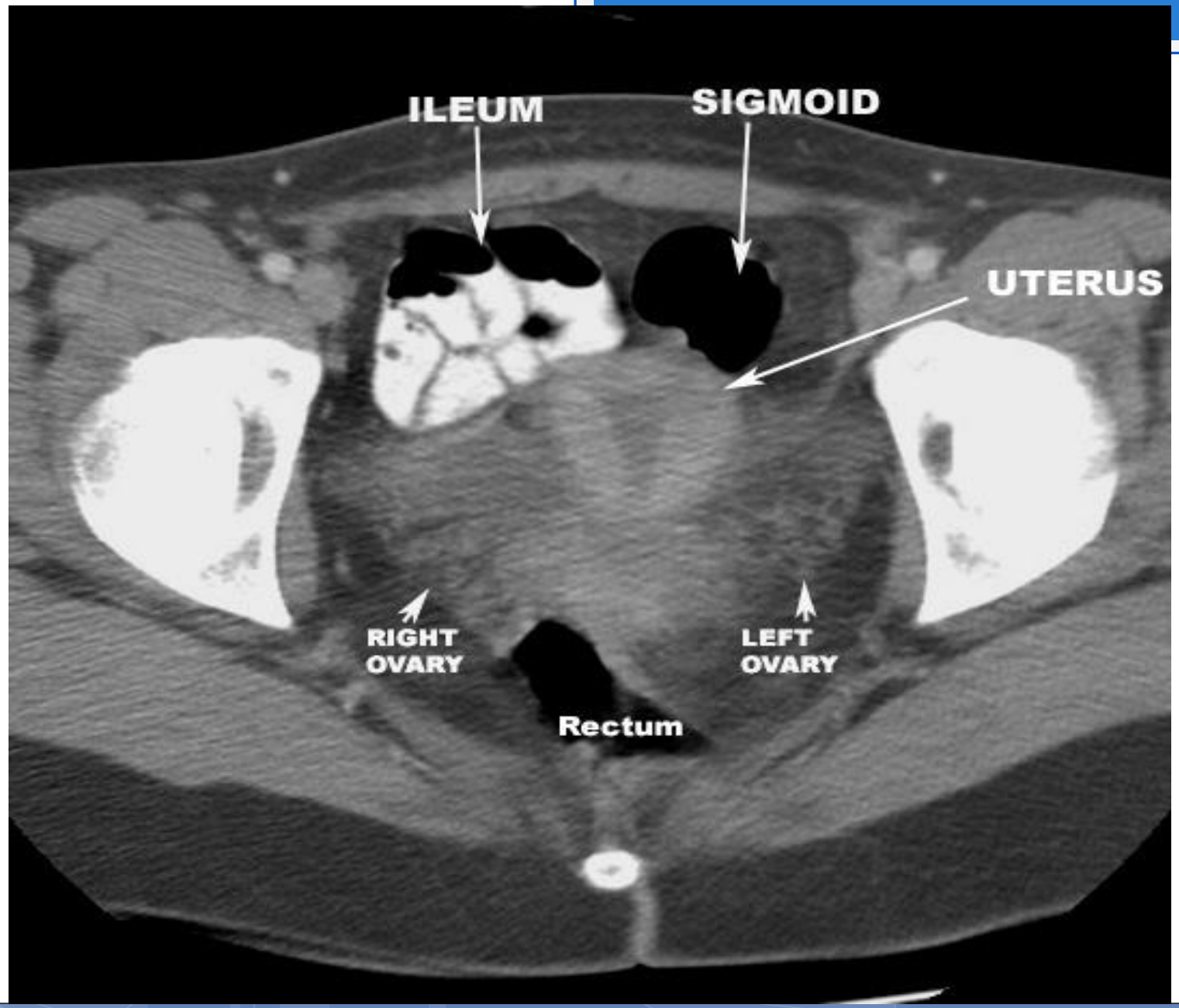

PSOAS
ILIACUS

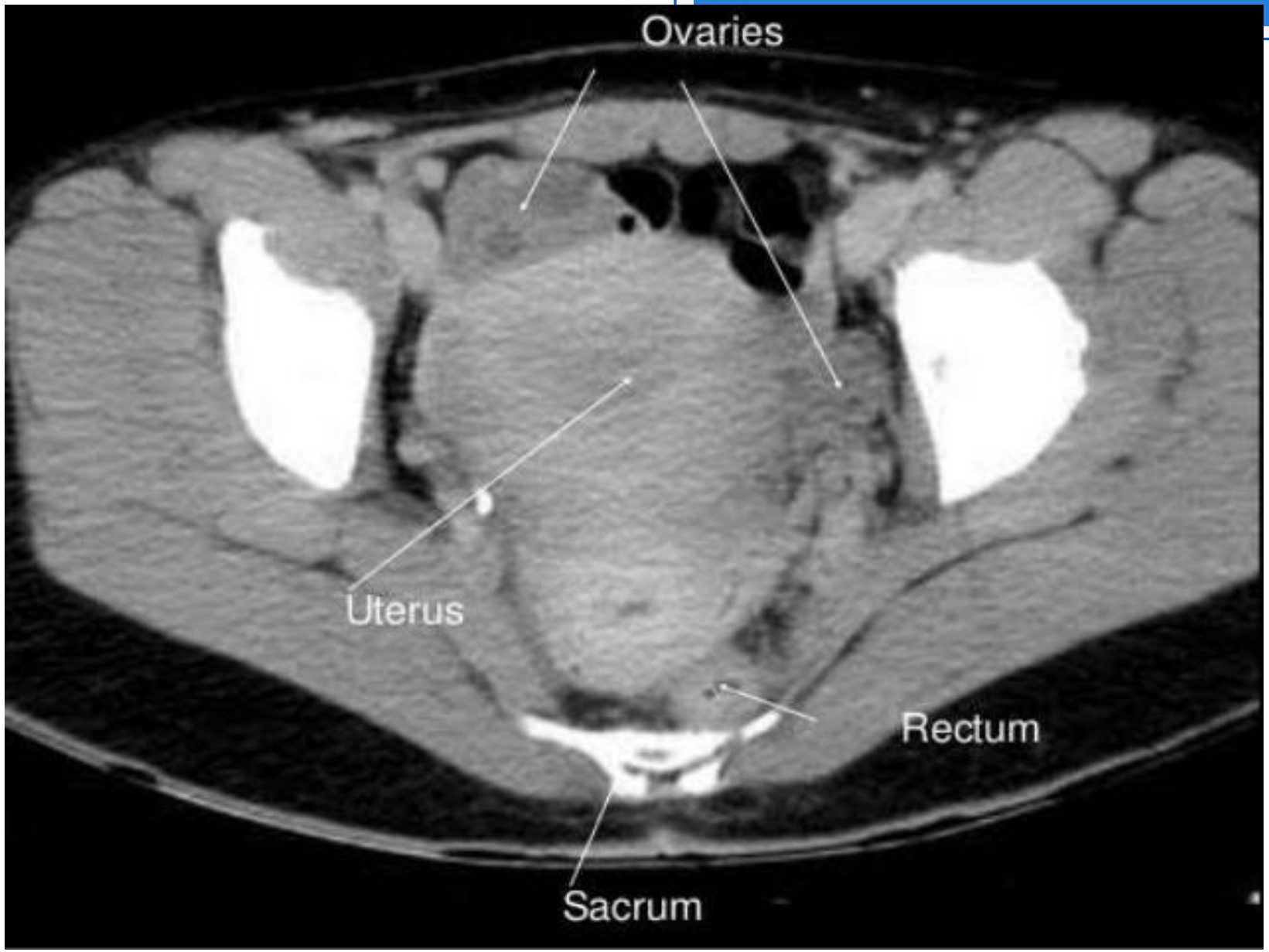
The Female Pelvis

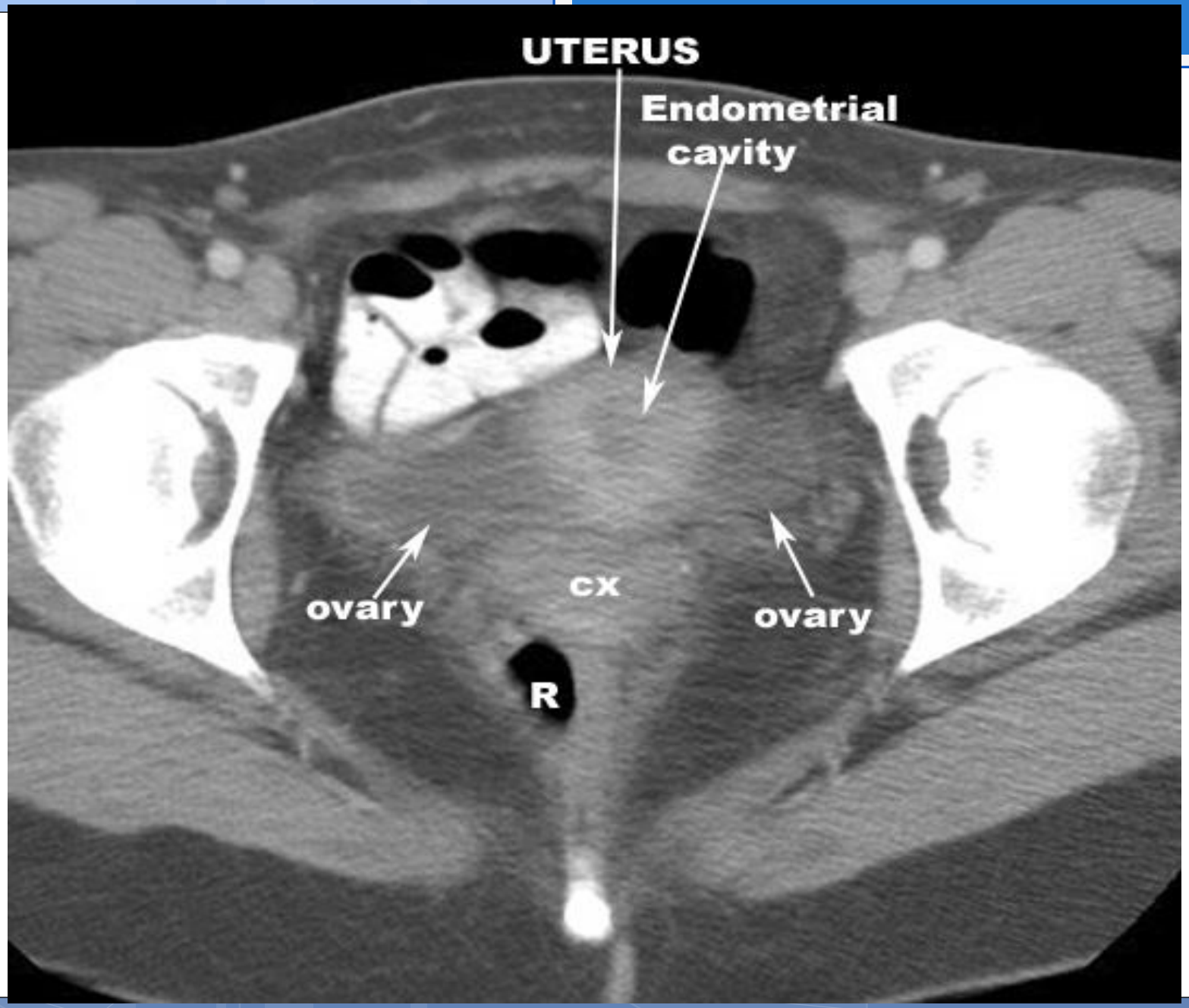
The male Pelvis

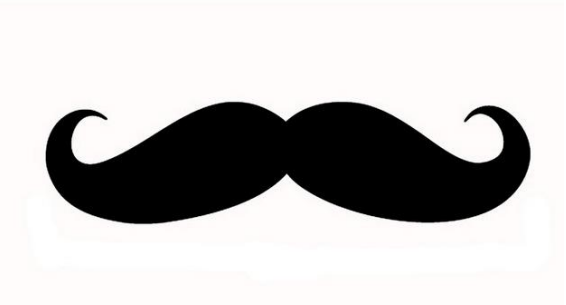


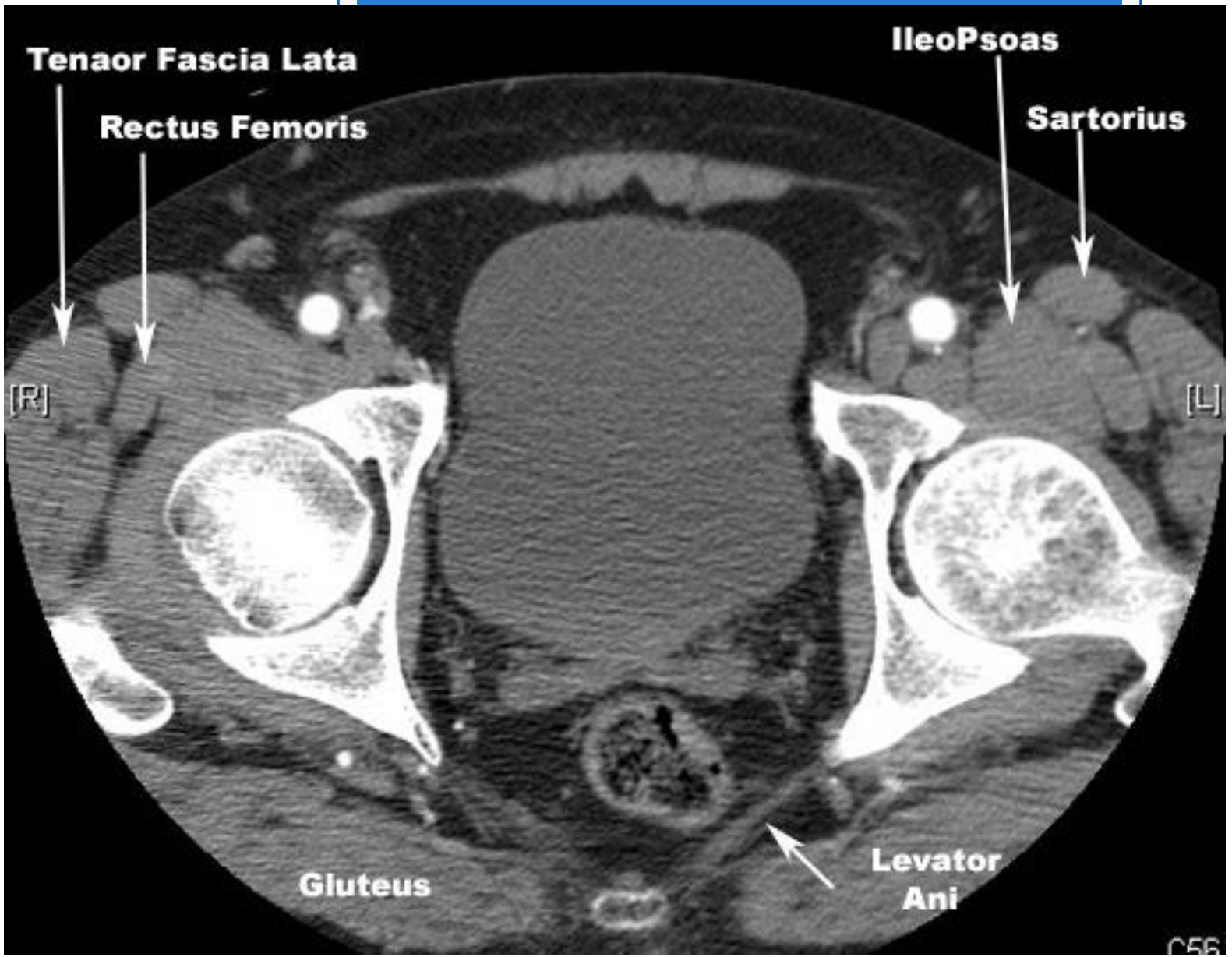


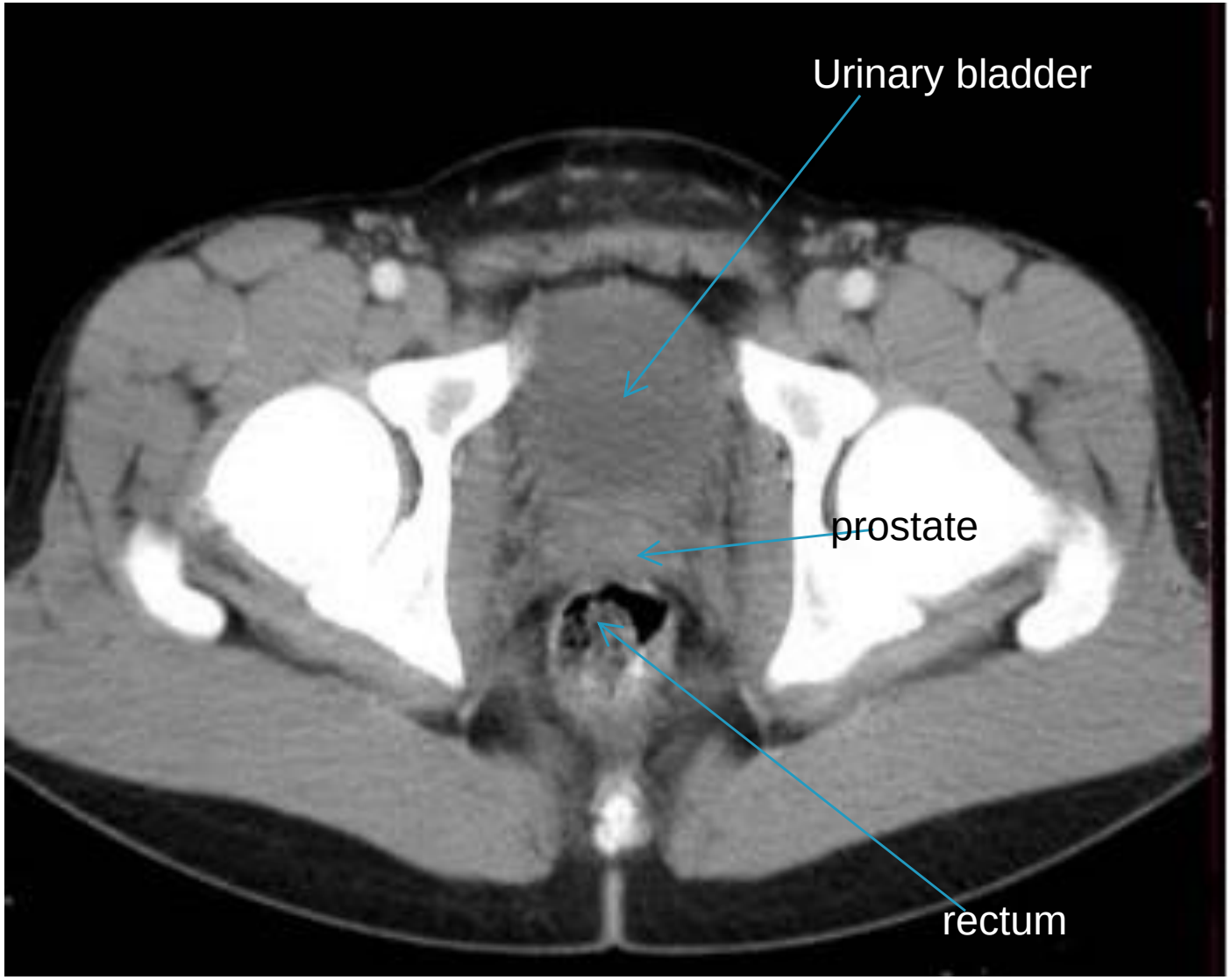

ILEUM
SIGMOID
UTERUS
RIGHT OVARY
LEFT OVARY
Rectum

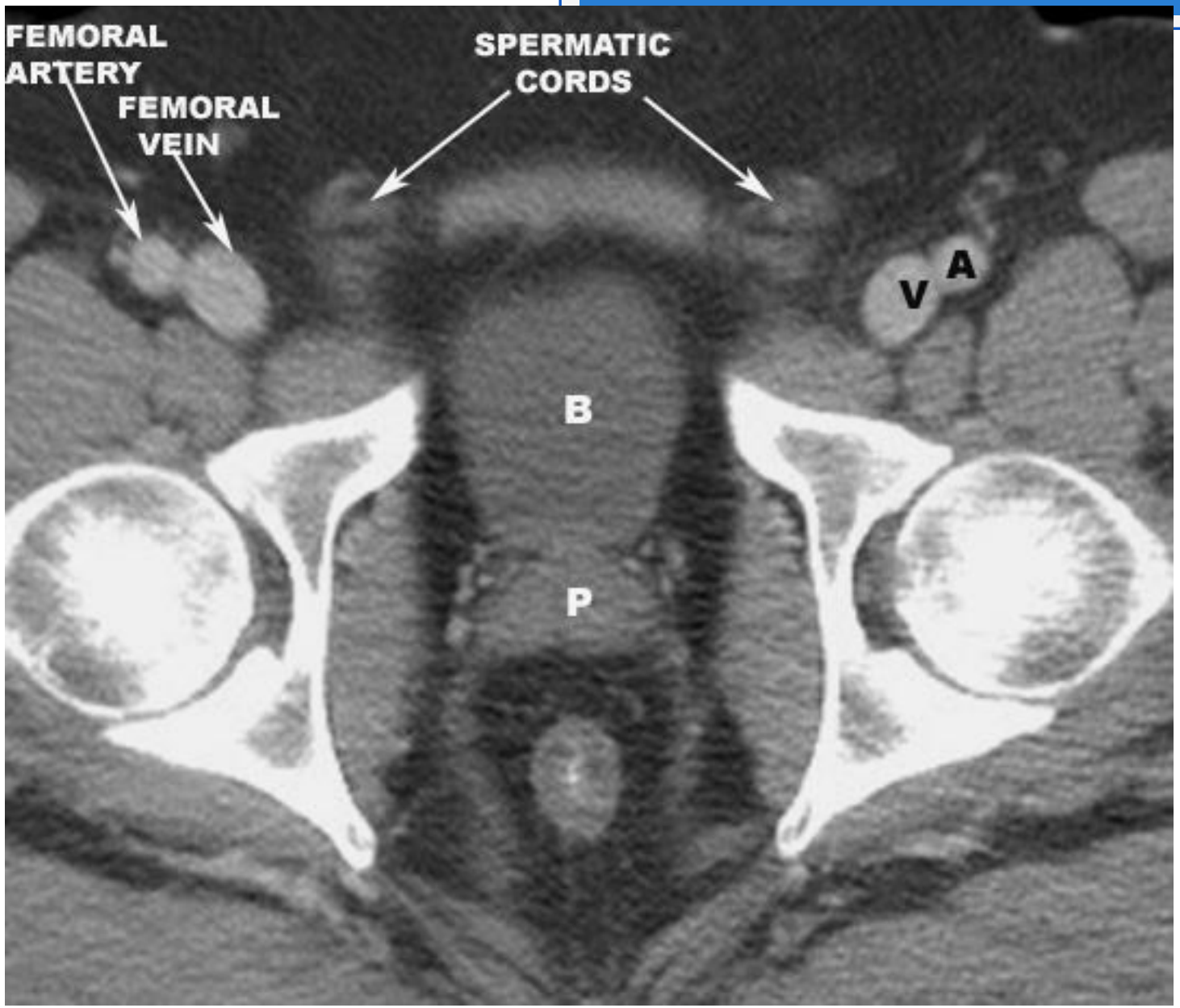

Ovaries
Uterus
Rectum
Sacrum


UTERUS
Endometrial
cavity
ovary
cx
ovary
R

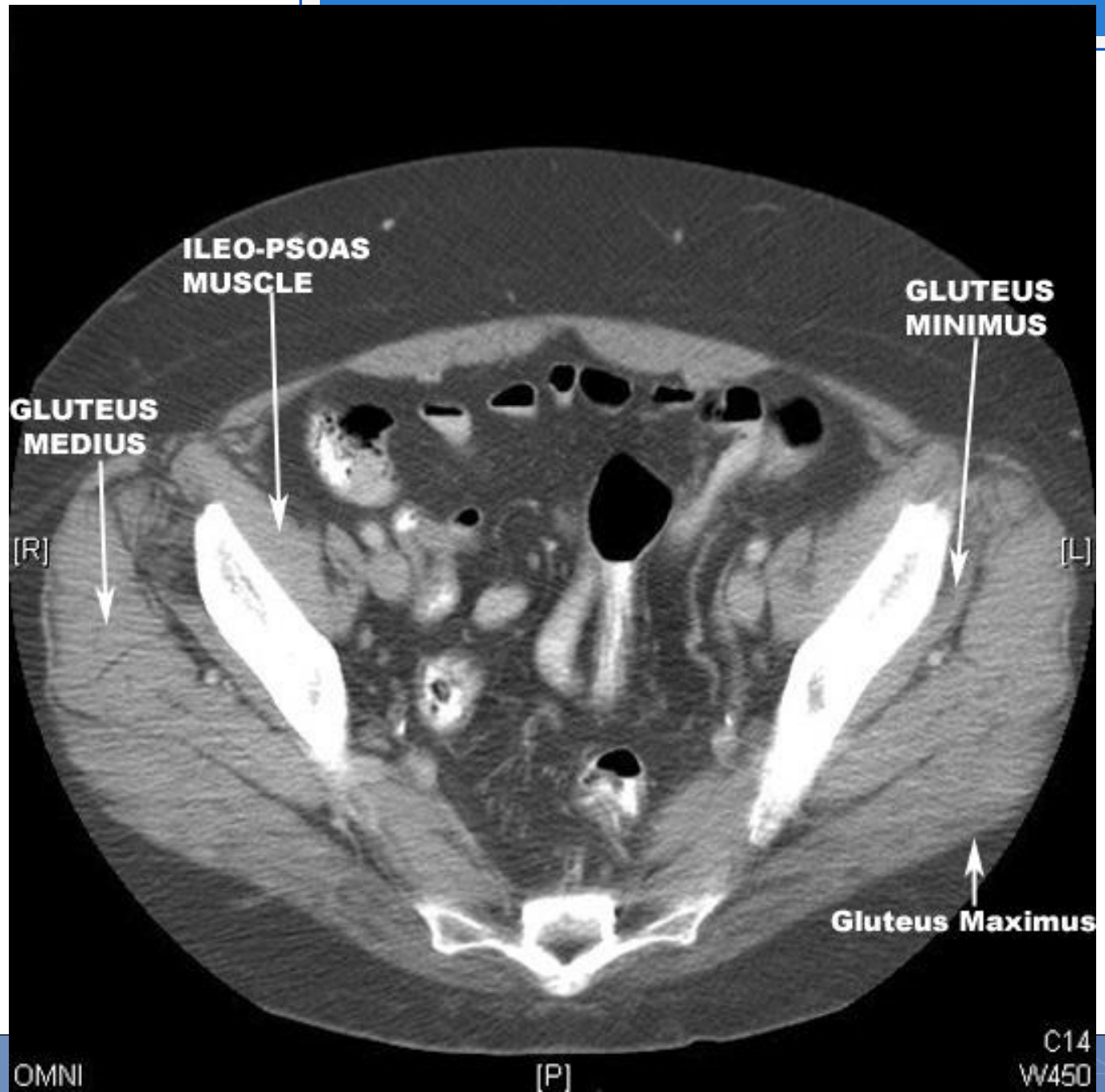


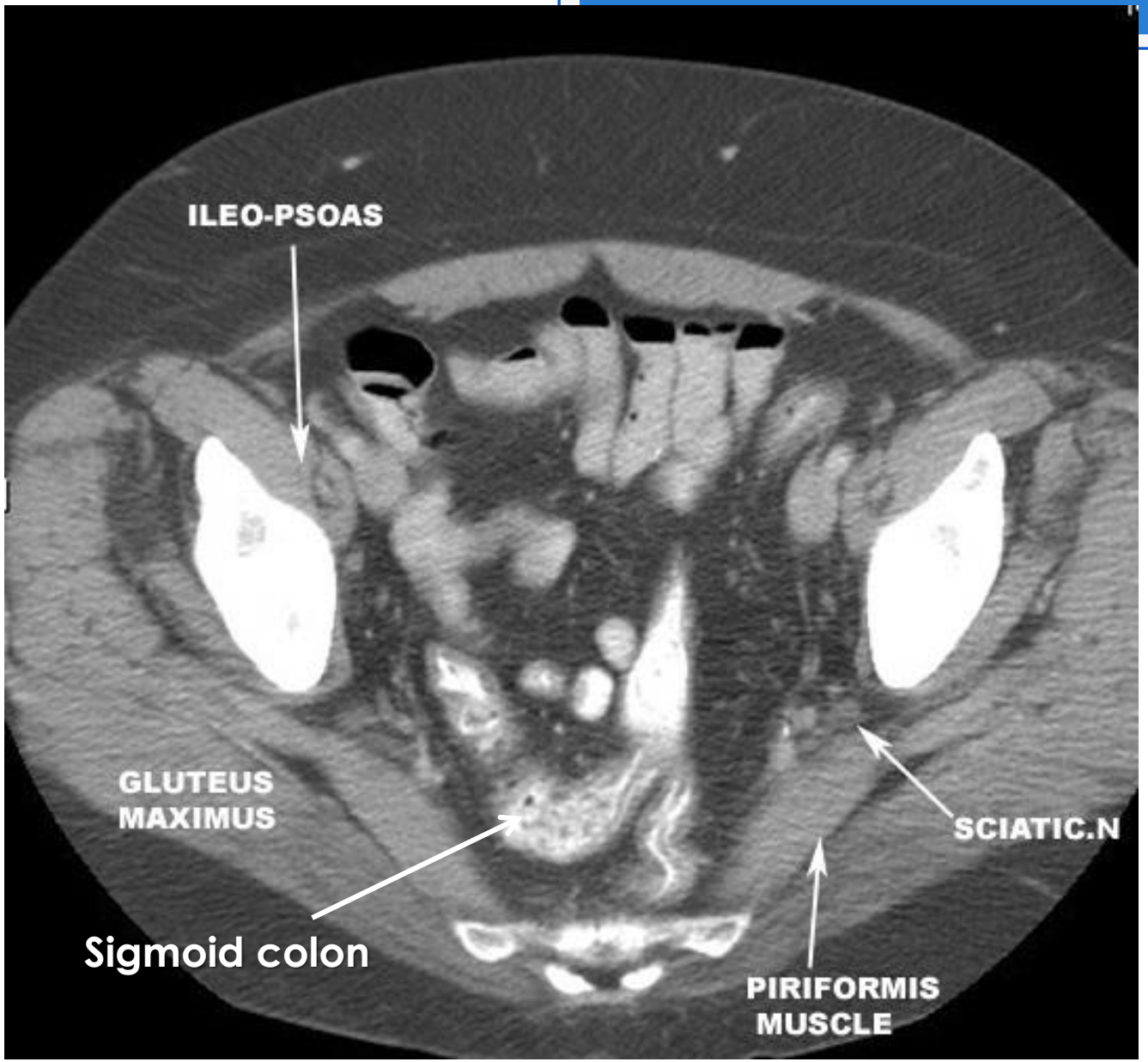

Tenaor Fascia Lata
Rectus Femoris
IleoPsoas
Sartorius
[R]
[L]
Gluteus
Levator
Ani

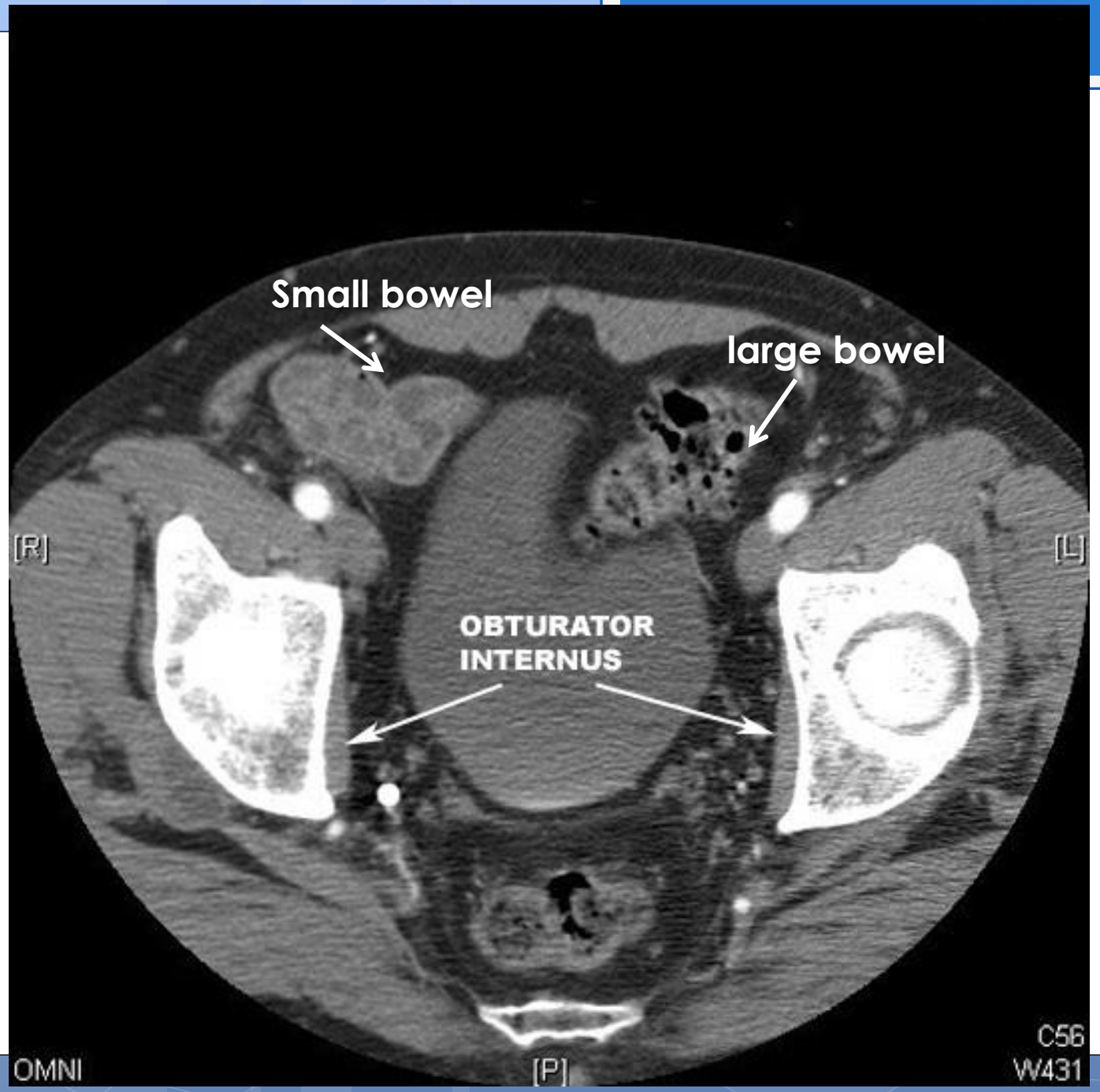

Urinary bladder
prostate
rectum

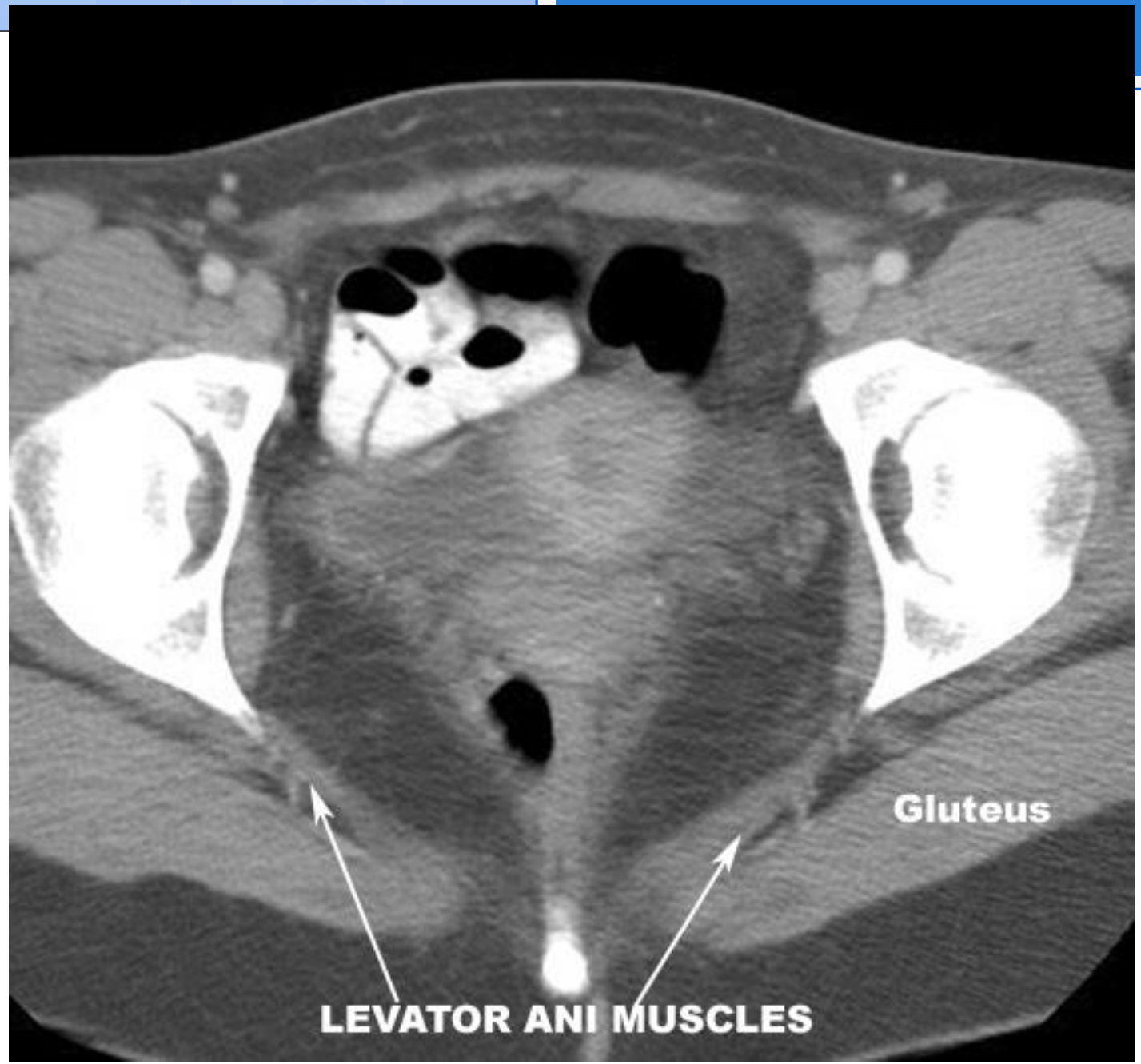

FEMORAL ARTERY
FEMORAL VEIN
SPERMATIC CORDS
V
A
B
P

Pelvic muscles



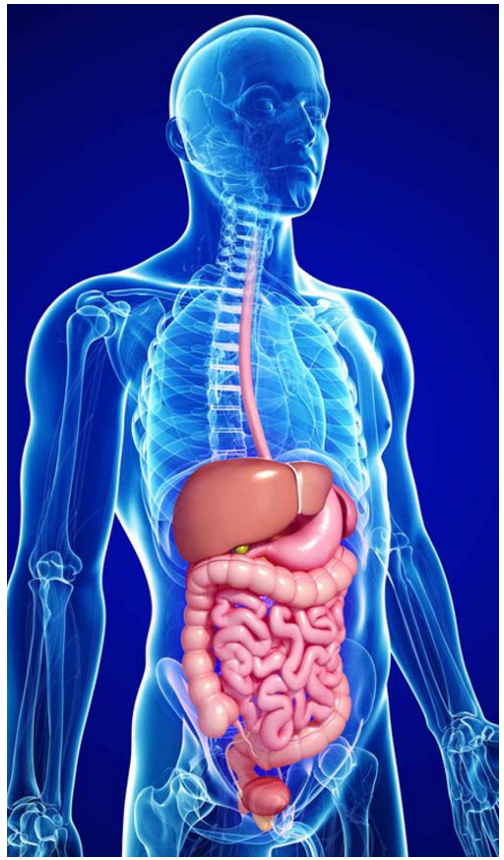

ILEO-PSOAS
GLUTEUS MAXIMUS
Sigmoid colon
PIRIFORMIS MUSCLE
SCIATIC.N


Small bowel
large bowel
[R]
[L]
OBTURATOR
INTERNUS
OMNI
[P]
C56
W431


Gluteus
LEVATOR ANI MUSCLES

GIS PATHOLOGY

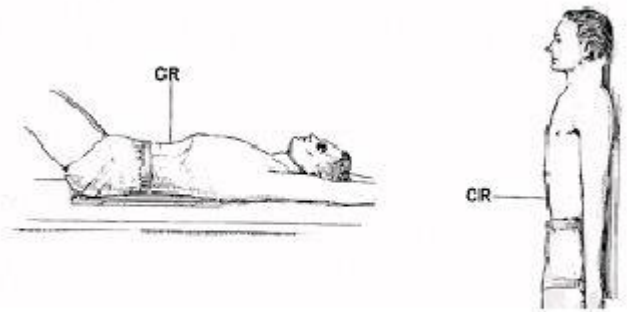
PLAIN FIILMS …
FLUROSCOPY



How to look at an abdominal X-ray

The initial inspection of any X-ray begins with a technical assessment. Establishment of the **"name, date, age and sex** of the patient at the outset is crucial"

Virtually every abdominal X-ray is an AP film, but these are occasionally accompanied by erect or even **decubitus views** (also APs). Usually the radiographer will **mark** the film with a badge or write on it by hand '**Supine**' or 'Erect' to guide you, so seek this out and use it.



Standard AP supine and upright abdominal patient position. Image courtesy of Dr. Naveed Ahmad.

AP SUPINE AND ERECT

It is worth knowing that only **five basic densities** are normally present on X-rays, which appear thus:

Gas - black

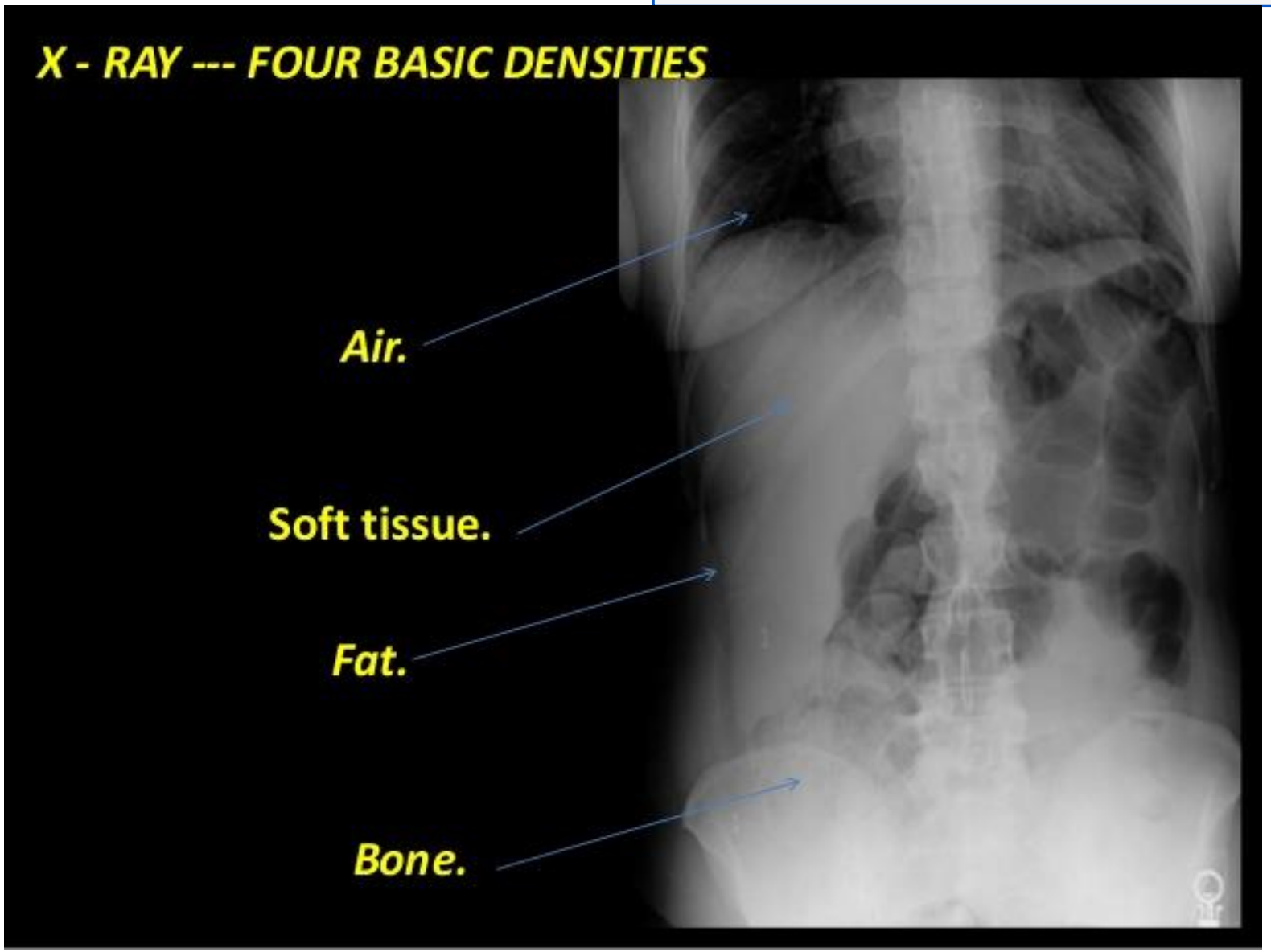
Fat - dark grey

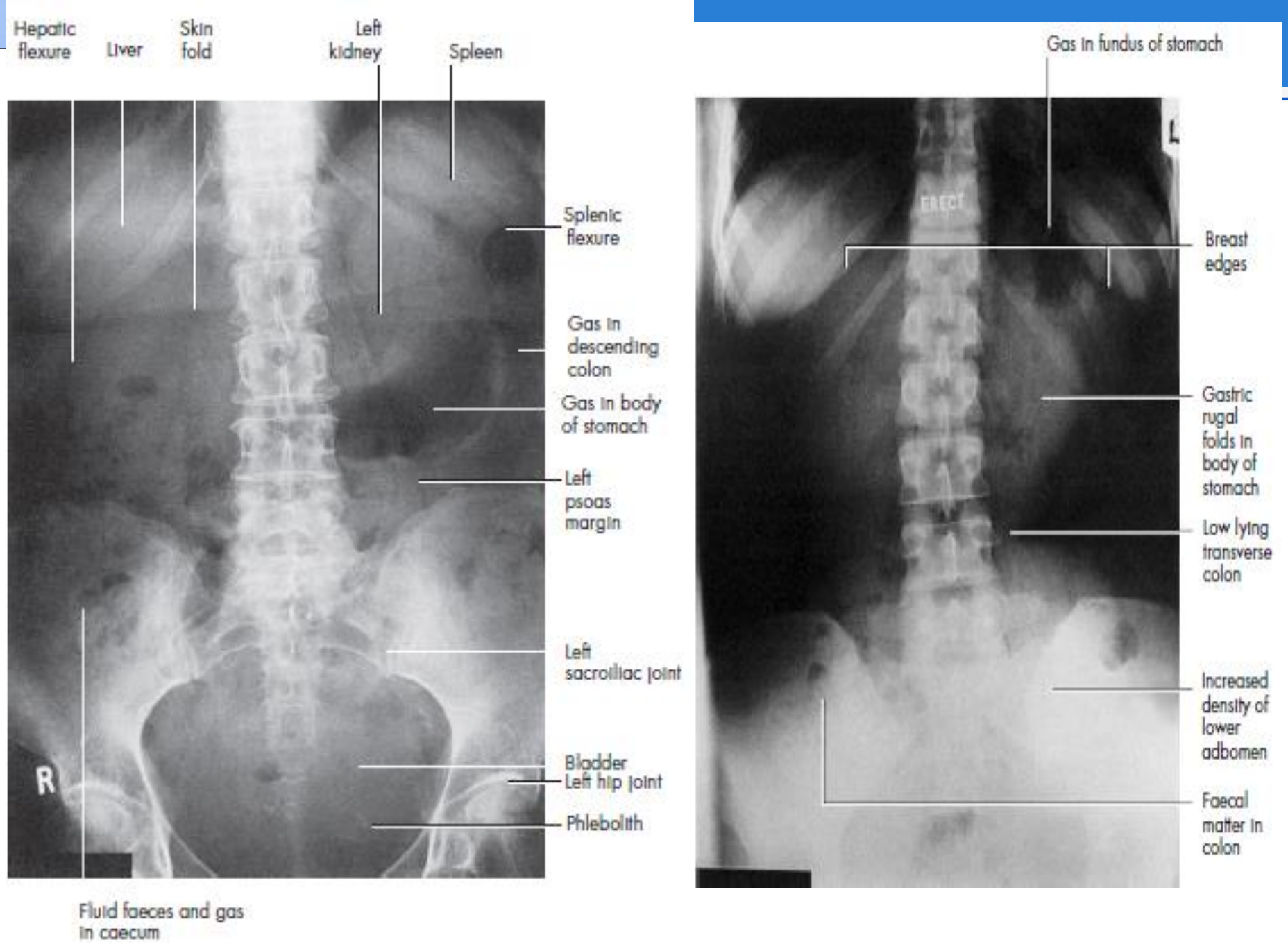
Soft tissue/fluid - light grey

Bone/calcification - white

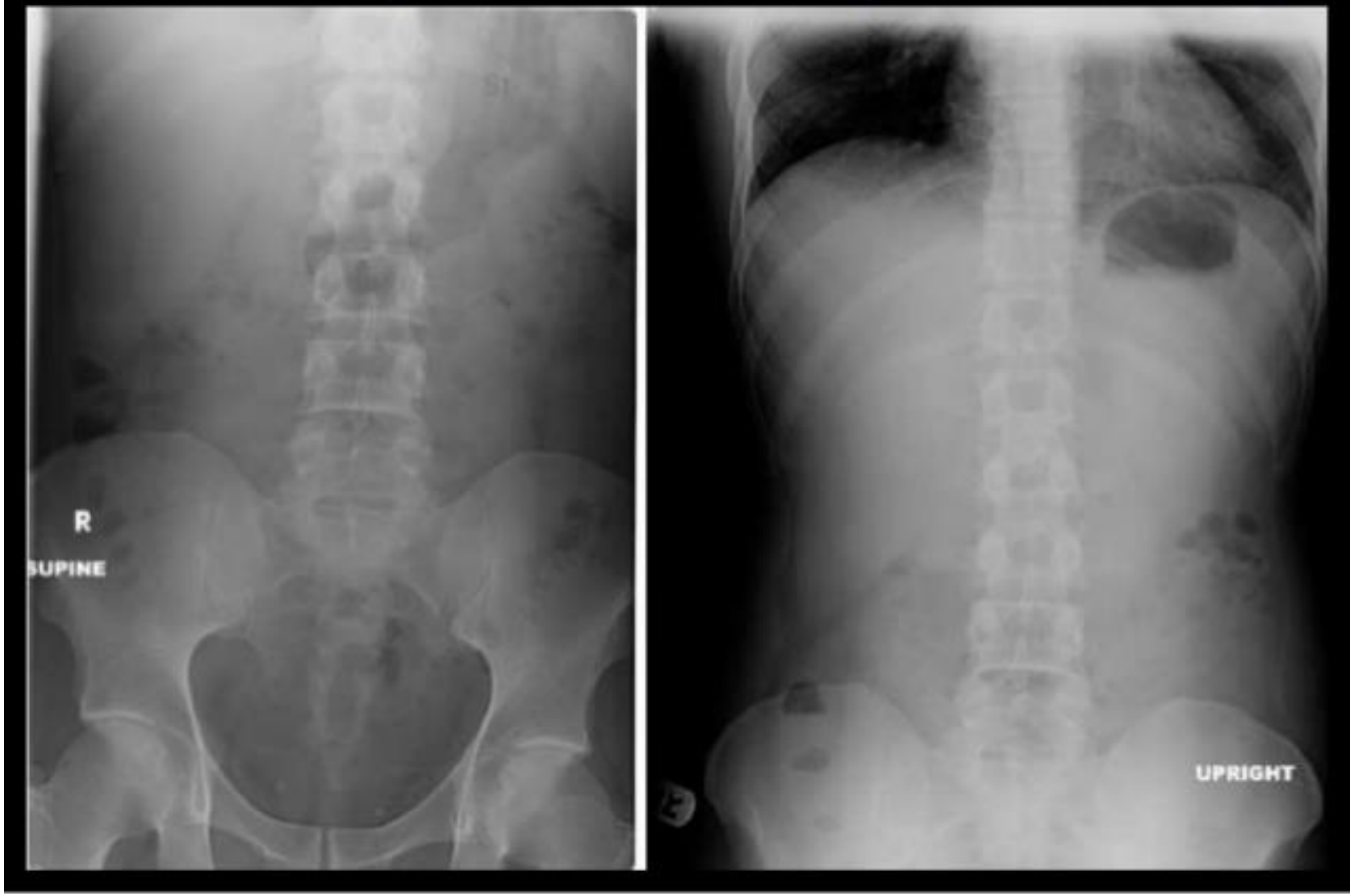
Metal – intense white

N.B: Always check left and right on every film, consciously and routinely –especially just before surgical operations.

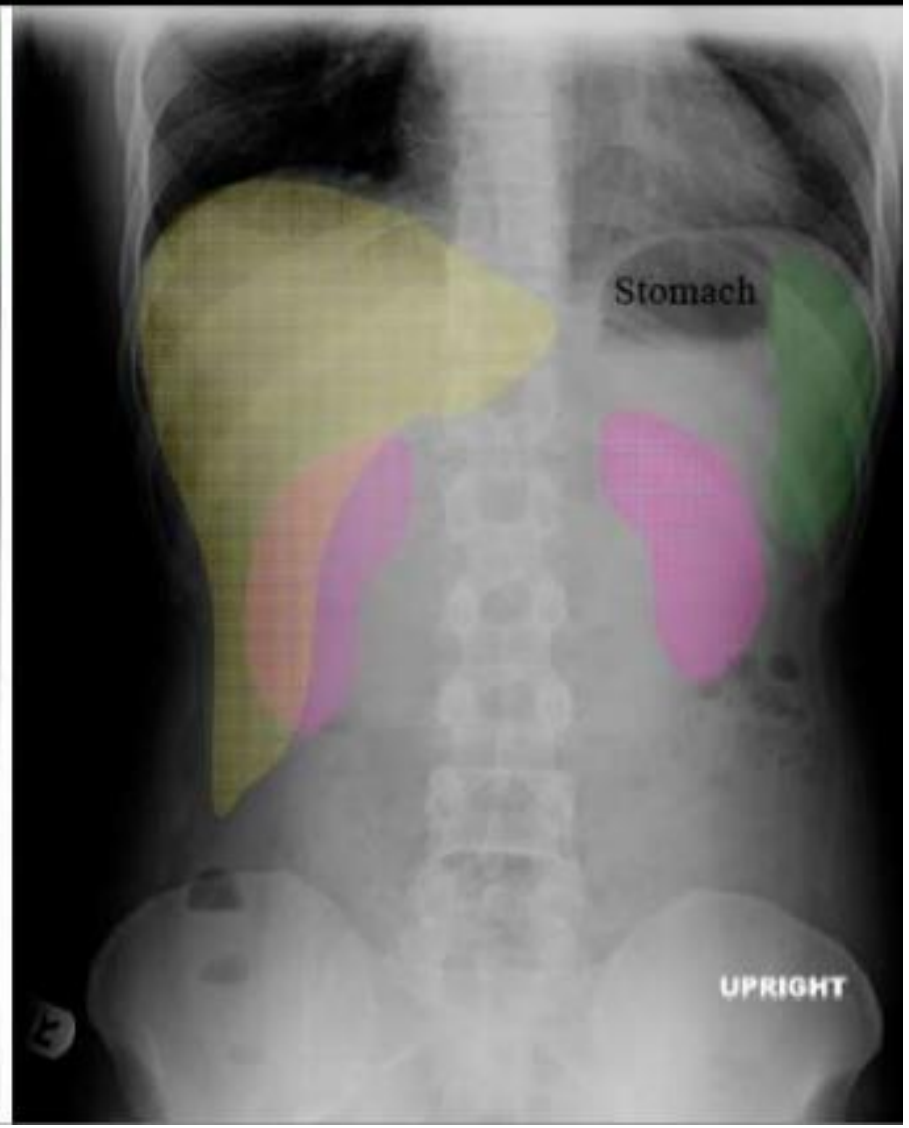

X - RAY --- FOUR BASIC DENSITIES
Air.
Soft tissue.
Fat.
Bone.


Hepatic flexure
Liver
Skin fold
Left kidney
Spleen
Splenic flexure
Gas in descending colon
Gas in body of stomach
Left psoas margin
Left sacroiliac joint
Bladder
Left hip joint
Phlebolith
R
Fluid faeces and gas in caecum
Gas in fundus of stomach
Breast edges
Gastric rugal folds in body of stomach
Low lying transverse colon
Increased density of lower adbomen
Faecal matter in colon

Plain Film Soft tissues : Liver, Spleen, & Kidney.



Soft Tissue Structures: Subtle on KUB.



The Abdominal Plain Film- Differentiating Large and Small Bowel

Characteristic	Small Bowel	Large Bowel
Position	• Central abdomen	• circumferential- the large bowel tends to *frame* the small bowel
Contents	• fluid-like succus entericus and air	• faeces of variable consistency from liquid to hard formed
Mucosal/Wall Pattern	• Can have a random faceted/tessellated appearance when air-filled (but not dilated). • Encircling valvulae conniventes visible depending on degree of air filling/distention. • Valvulae conniventes more widely spaced in ileum • Wall pattern can be effaced if distended	• Haustral folds interspaced with Plicae semilunaris • Wall pattern can be effaced if distended
Size	• Up to 30mm	• Up to 50-60mm • Up to 90mm for the caecum

The 3,6,9 Rule

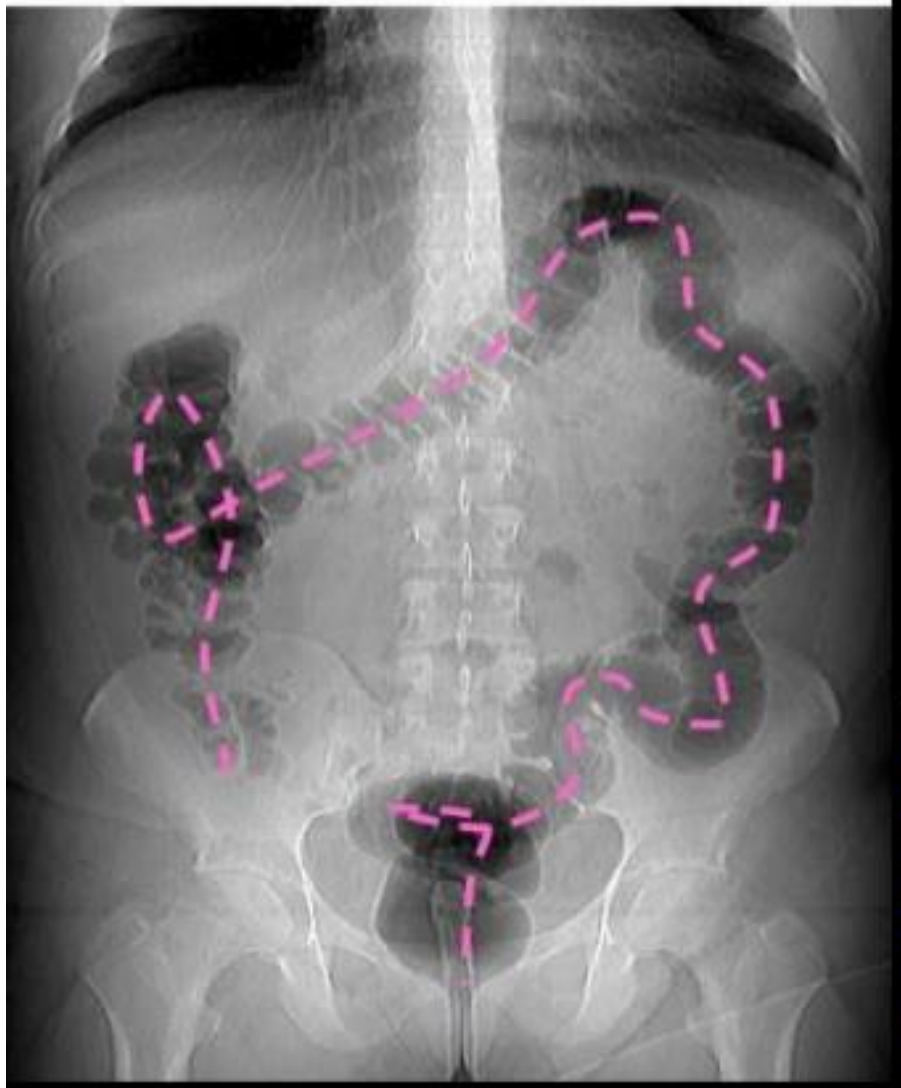
The maximum diameter of the bowel is shown below

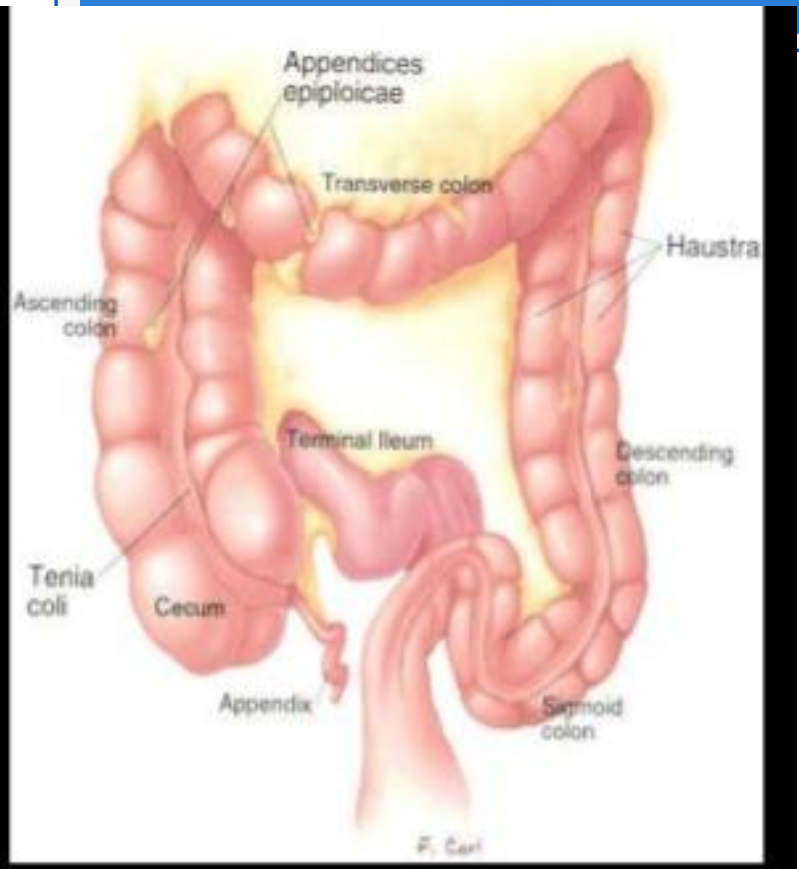
	Maximum Normal Diameter
small bowel	30mm
large bowel	50-60mm
caecum	90mm

Figure 3. Valvulae conniventes

Haustral Pattern

Small vs. Large Intestine





- ***Colon has sacculations called haustra as teniae coli are shorter than the colonic wall***
- ***Colon is relatively peripheral but can be very mobile***

Pathological findings on plain films

GAS

- Intra-luminal
- Extraluminal
  - Intra-peritoneal
  - In portal
  - In biliary tree

CALCIFICATION

- Phleboliths
- Vascular calcifications
- Calcified LNs
- GBS
- RS / UBS
- Splenic / hepatic granulomas
- Appendicoliths / enteroliths
- Calcified adrenals

Intralumenal gas

Begin by looking at the amount and distribution of gas in the bowels **(intraluminal gas)**. There is considerable normal variation in distribution of bowel gas.

On the erect AXR, the **gastric gas bubble** in the left upper quadrant of the film is a normal finding. Gas is also normally seen within the **large bowel**, most notably the **transverse colon and rectum**.

Important characteristics of bowel loops to bear in mind are their **size and distribution**(where they are situated in relation to other structures). Normal small bowel should measure less than 3 cm in diameter, whereas normal colon should measure less than 5 cm in diameter.

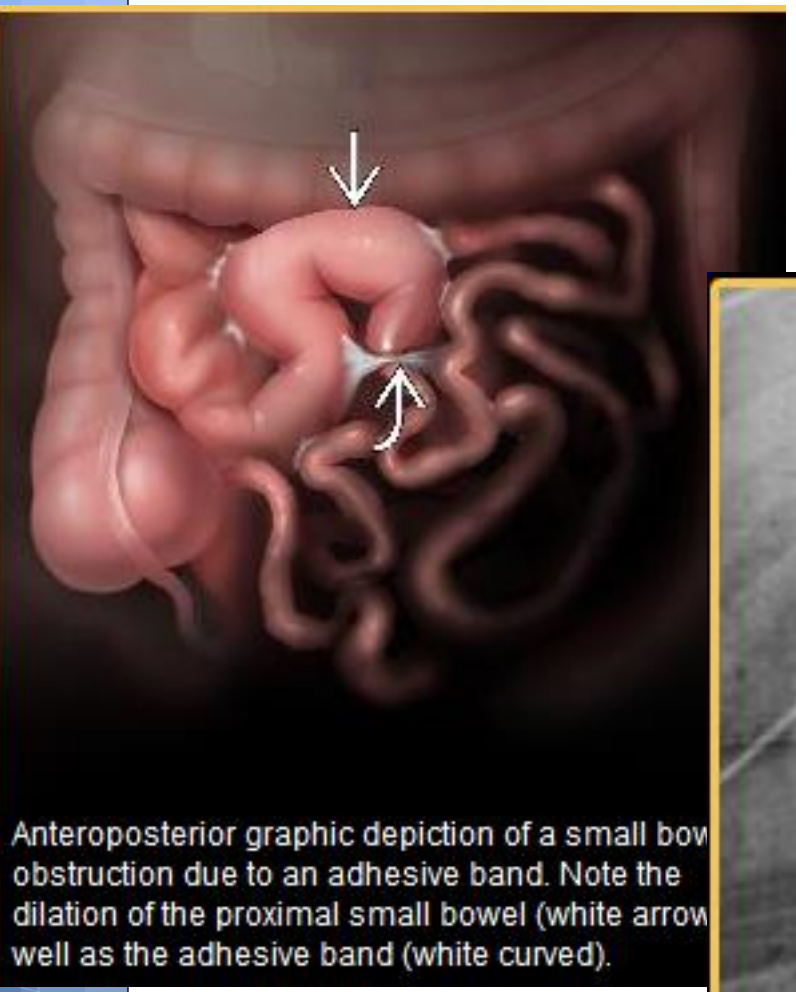
Small Bowel Obstruction

- Dilated SB (> 3 cm): SUPINE VIEW

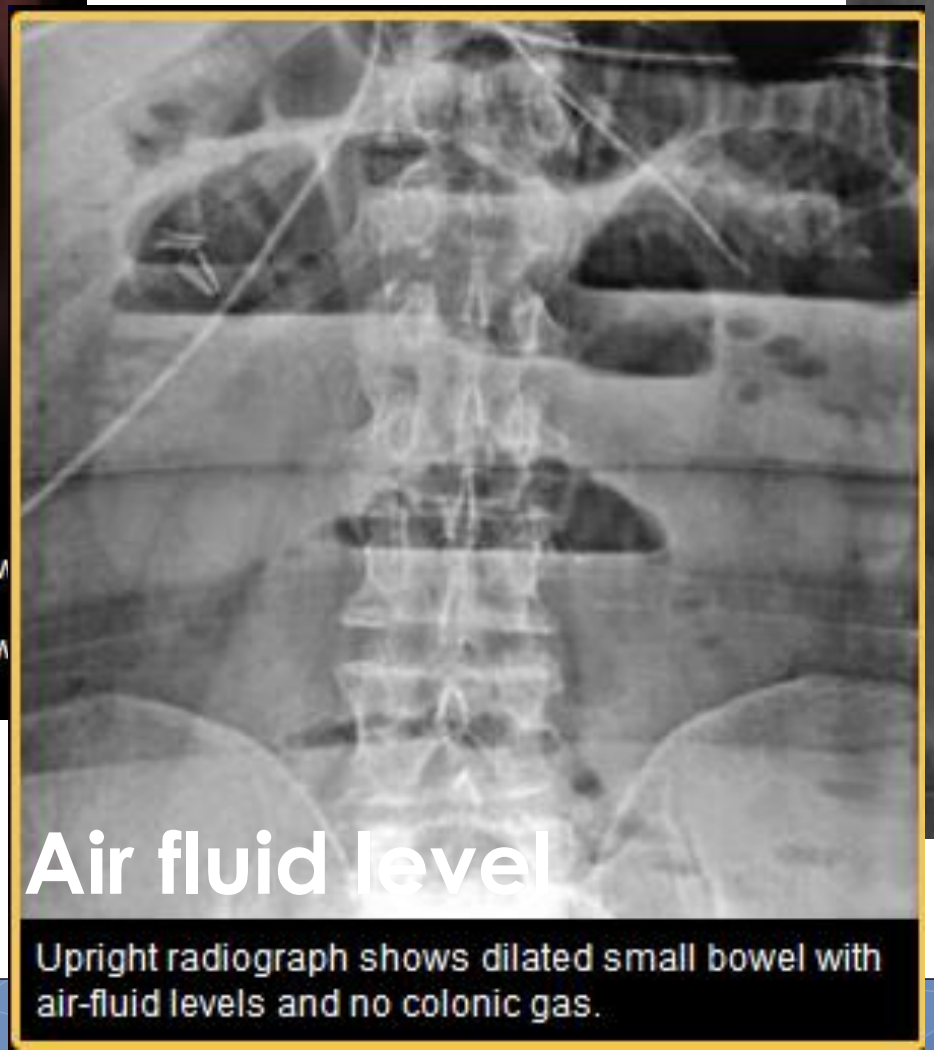
- Transition zone between normal and abnormal bowel critical to define site and cause of obstruction

- Multiple air-fluid levels (five-two) , (two-five) rule: ERECT VIEW

Small Bowel Obstruction



Anteroposterior graphic depiction of a small bow
obstruction due to an adhesive band. Note the
dilation of the proximal small bowel (white arrow
well as the adhesive band (white curved).



Air fluid level

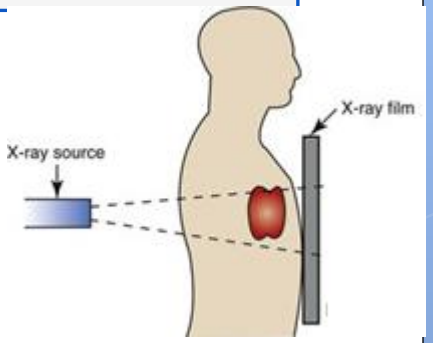
Upright radiograph shows dilated small bowel with air-fluid levels and no colonic gas.

Small bowel dilatation

Large bowel dilatation

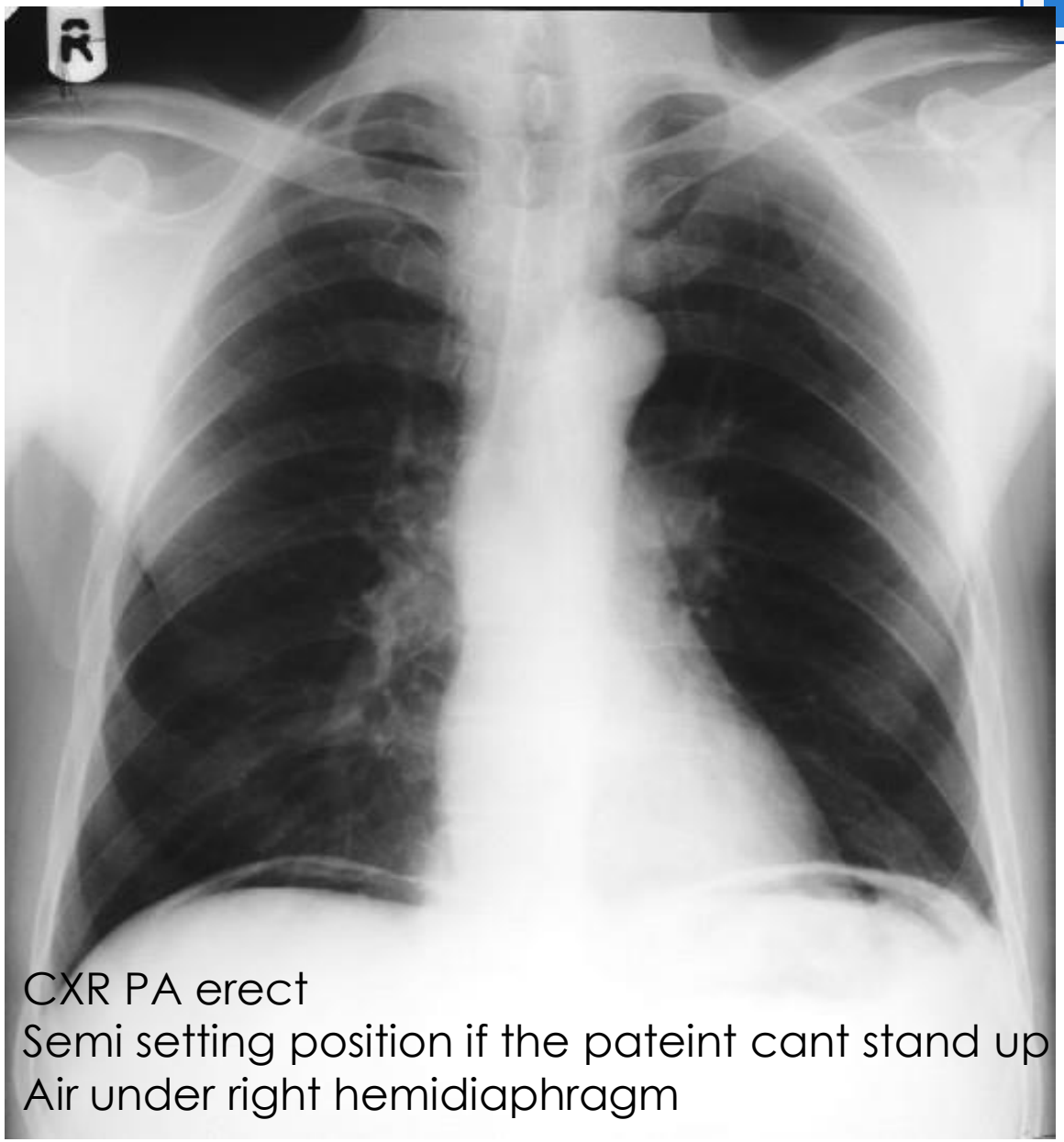
Diameter more than 6 cm

Extraluminal gas / intra-peritoneal …



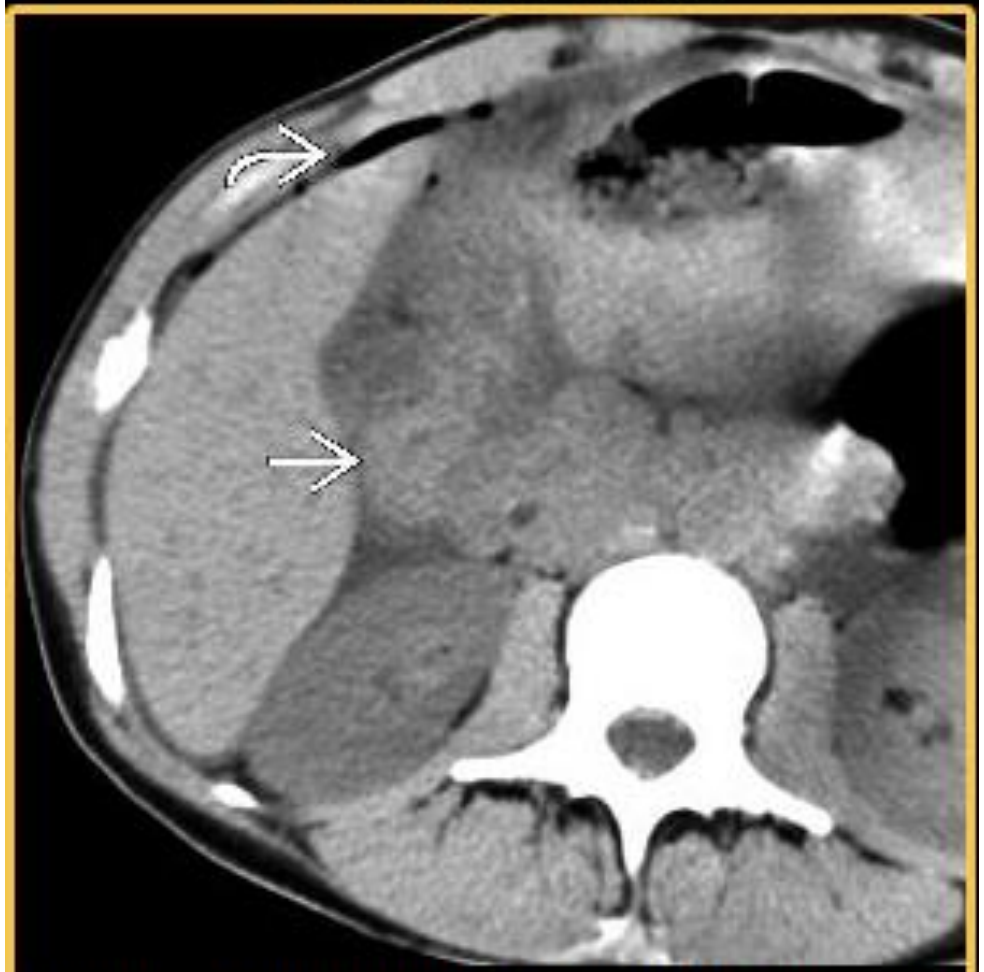
- Gas outside the bowel lumen is invariably abnormal. The largest volume of gas you might see is likely to be under the right diaphragm on **CXR** : this occurs after a viscus has been perforated. This gas within the peritoneal cavity is termed **pneumoperitoneum.**
- Gas out side bowel lumen often abnormal& it is location can usually be assessed by plain films.
- **Common cause of spontaneous pneumoperitoneum is perforated peptic ulcer**
- ***Free intraperitoneal air is a normal finding after a laparotomy (7 days)***

Pneumoperitoneum



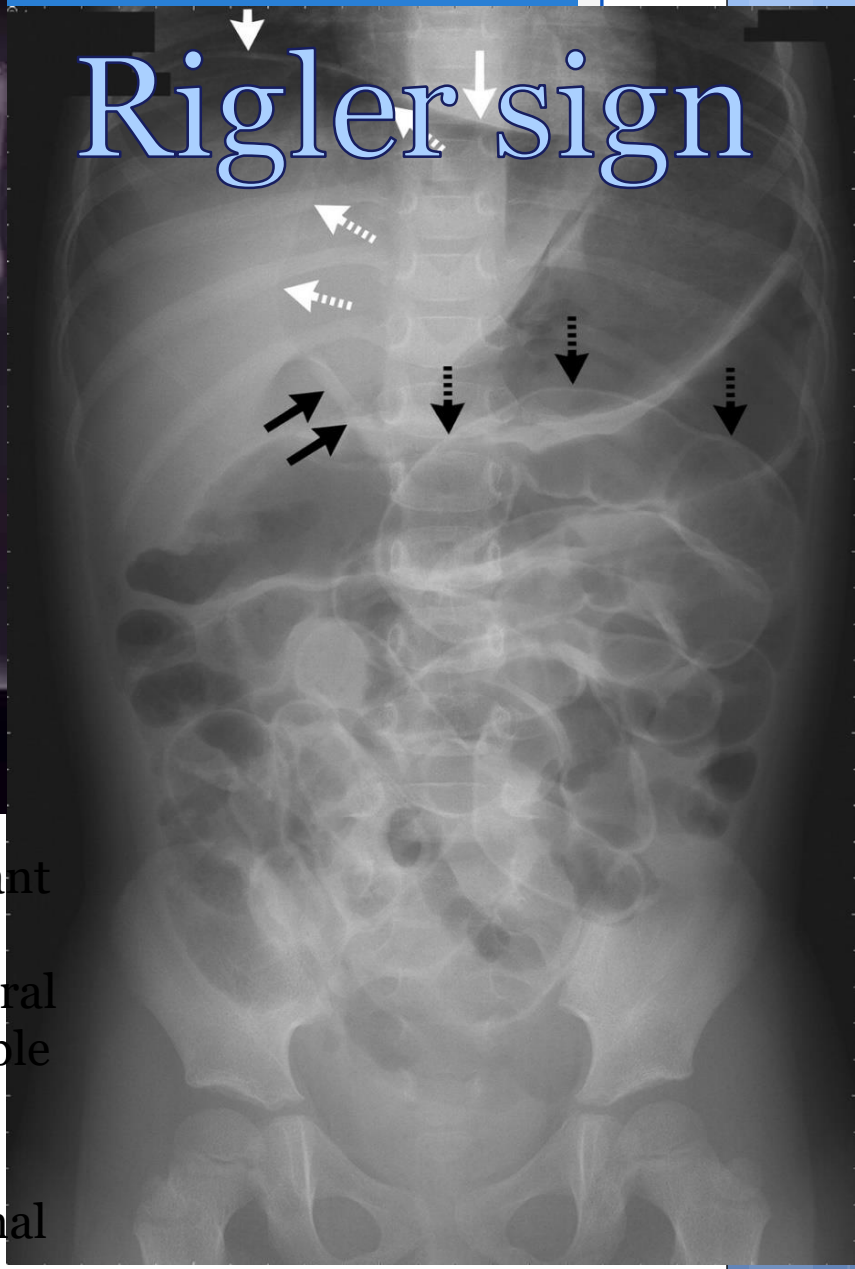
CXR PA erect
Semi setting position if the pateint cant stand up
Air under right hemidiaphragm

Duodenal Ulcer



Axial NECT shows mural thickening of the 2nd part of the duodenum (white arrow), with infiltration of adjacent fat planes and free intraperitoneal gas (white curved).

(Dirty fat planes)



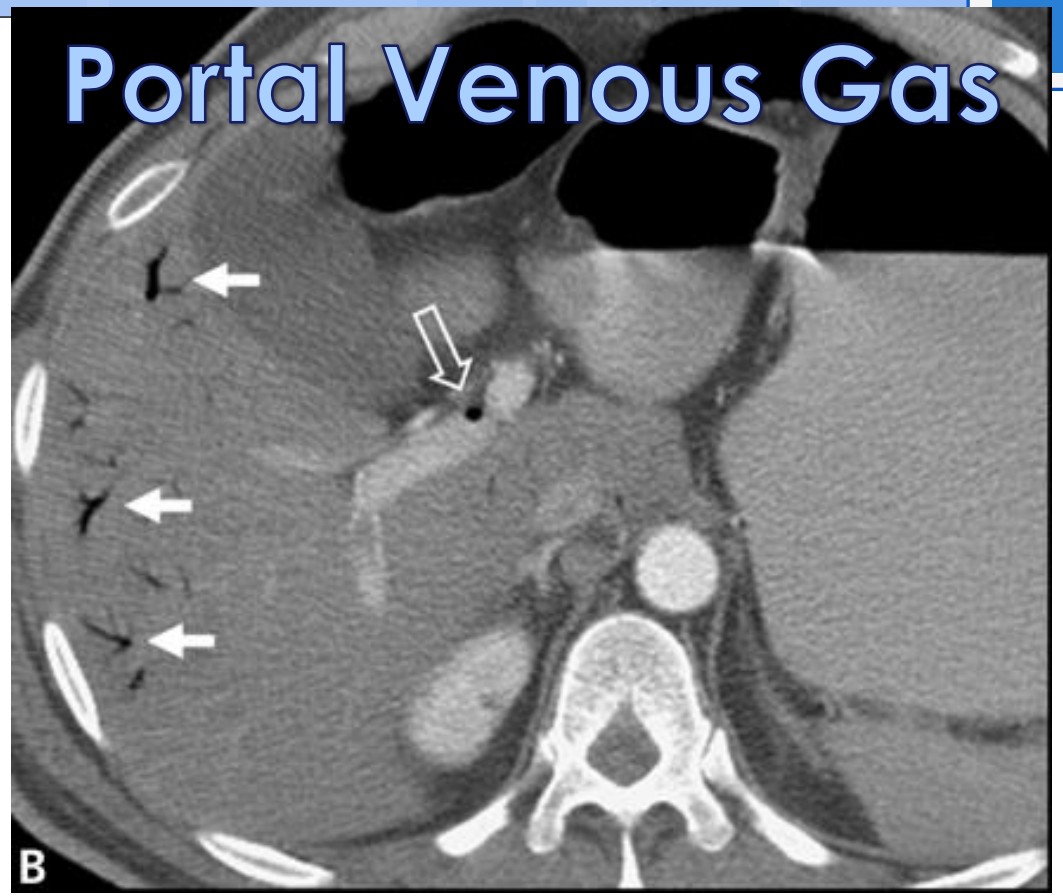
The plain-film radiograph of the abdomen showed several signs of free intraperitoneal gas. These included air accumulation in the right upper quadrant (the subphrenic area and ventral surface of the liver) (solid white arrows); the **falciform-ligament sign**, visible as a longitudinal linear density on the ventral surface of the liver (dashed white arrows); **the ligamentum teres sign**, visible as a linear density running along the inferior edge of the falciform ligament (solid black arrows).

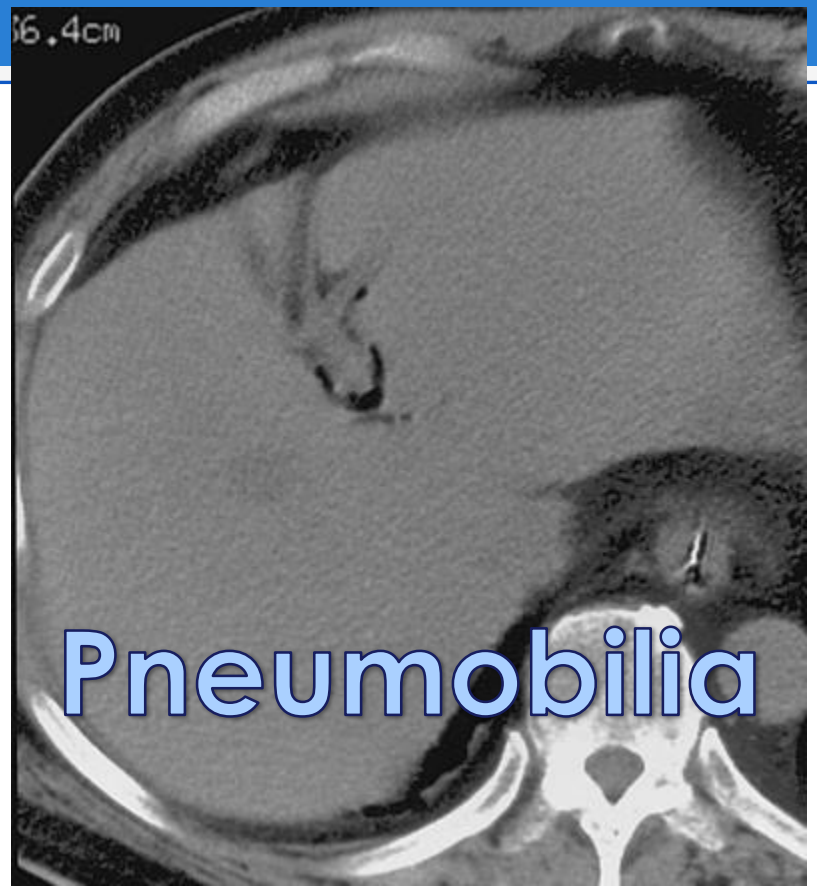
Rigler sign: Prominent bowel walls surrounded by both intra and extraluminal air (dashed black arrows)

Gas In the biliary tree / portal vein …

- Gas in the right upper quadrant within the biliary tree is a "normal" finding **after *sphincterotomy or biliary surgery***, but it can indicate the presence of ***a fistula between the biliary tree and the gut***.

- Beware of gas in the portal vein, as this can look very similar to biliary air. ***Gas in the portal vein is always pathological and frequently fatal***. It occurs in ***ischemic states***, such as toxic mega colon, and it may be accompanied by gas within the bowel wall (intramural gas).





Portal Venous Gas; Contrast CT image reveals gas in the portal vein, seen as air-density tubular structures extending ***to the periphery of the liver***. Gas in the biliary tree(Pneumobilia) is central and does not extend into the peripheral 2 cm of the liver. In this case, portal venous gas was associated with *infarction of the small bowel*.

Gas in Bile Ducts

Biliary-Enteric Anastomosis

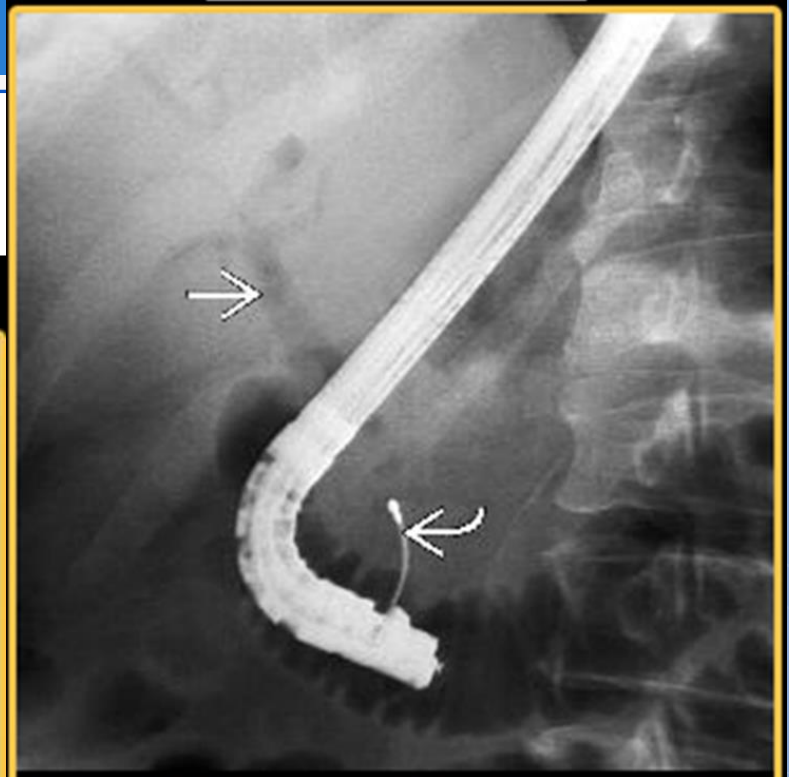
Frontal radiograph shows classic radiographic appearance of pneumobilia with a branching gas pattern (white arrow) limited to the porta hepatis. Small bowel and liver transplantation.

Air within the hilum of the liver

Biliary-Enteric Anastomosis

Axial NECT shows pneumobilia (white arrow) in a patient who had biliary-enteric anastomosis as part of a liver & small bowel transplantation.

Sphincterotomy



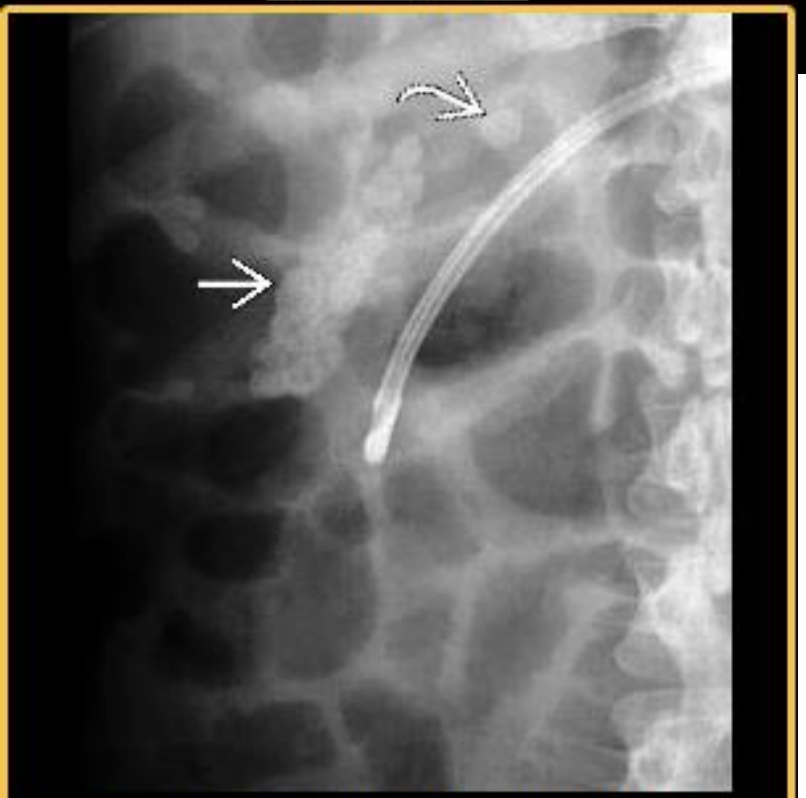
Oblique ERCP shows gas in the bile ducts (white arrow) and the endoscope with a sphincterotomy device (white curved) in place.

- gallstone ileus
- Iatrogenic ERCP
- Post some surgeries that connect biliary tree to the GIS (choledocho …. Jejunostomy, iliostomy)

Calcification …

EXDDX: Abdominal Calcifications

Gallstones



Frontal radiograph shows a feeding tube in the duodenum and a cluster of dozens of gallstones that fill the gallbladder (white arrow) and obstructed the GB neck (white curved).

% of radio-opaque gallstones?

15%

Addison's disease, X-ray
calcified adrenal glands

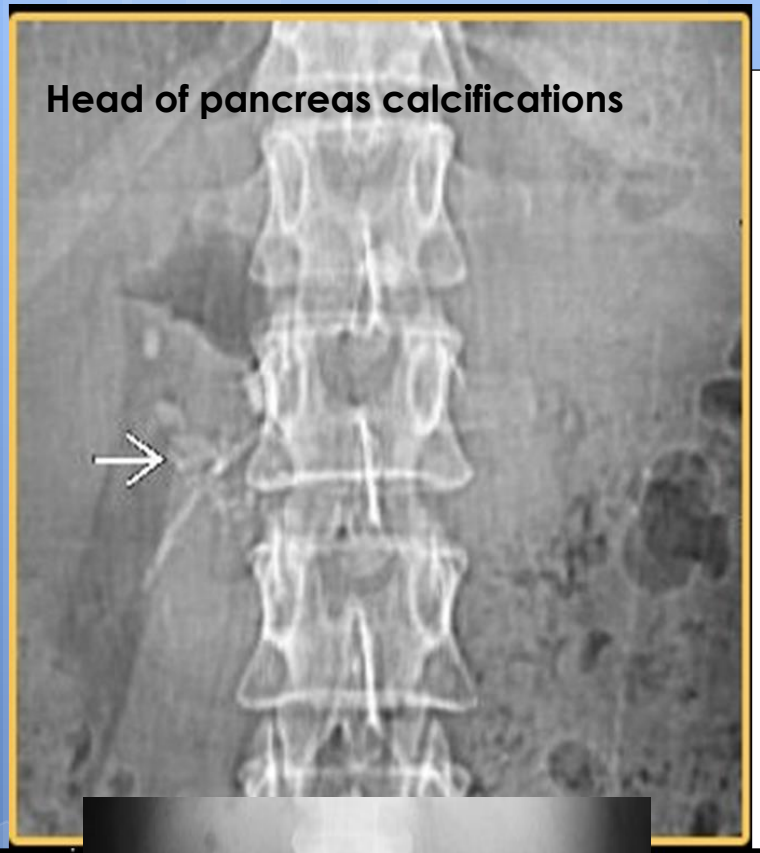
Urolithiasis

Anteroposterior radiograph shows a typical punctate calcified stone (white arrow) in the right kidney & a large "staghorn" calculus (white open) in the left.

% of radio-opaque urinary stones?

%85

Head of pancreas calcifications



n radiograp

the pancreas.

Arterial Calcification and Aneurysm

Frontal radiograph shows a spherical eggshell calcification (white arrow) in the pelvis; large common iliac artery aneurysm.

Abdominal Incision & Injection Sites

Frontal radiograph shows a cluster of calcified injection granulomas (white arrow) overlying the lower abdomen, but located within the subcutaneous fat of the buttocks.

EXDDX: Abdominal Calcifications

Uterine Leiomyoma (Fibroid)

Frontal radiograph shows a small pelvic "popcorn" type calcification (white arrow), one of the common forms of calcification in a degenerated uterine fibroid (leiomyoma).

Appendicolith

Phleboliths

Frontal radiograph shows multiple phleboliths in the pelvis, having their typical distribution, mainly below the iliac spines, some with central lucency (white arrow).

pelvic vein phleboliths (calcified thrombi) mostly 5mm or less with central lucent

FLUOROSCOPY

Filling defect / Ulceration / stricture …

With oral contrast

Contrast Agents …

A diagnostic image is composed of differences in contrast between tissues which result from differences in radiation reaction in the tissue.

Contrast media are so called as they increased the image contrast of anatomical structures which are not normally easily visualized.

Iodine-based and barium-sulfate compounds are used in x-ray and computed tomography (CT) imaging exams.

Barium sulphate

Barium sulphate is best contrast media for GIT;
excellent opacification.
good coating for mucosa.
completely inert.
inexpensive.

contraindicated in suspected perforations/ obstruction.

Iodinated contrast media
Low osmolar weight (LOCM)

Iodine based contrast media are usually classified as ionic or non-ionic. Only non ionic C.M is used nowadays in diagnostic radiology. It is primarily used to visualize vessels, and changes in tissues on radiography and CT, but can also be used for tests of the urinary tract, uterus and fallopian tubes.

Can be used safely in suspected perforation

disadvantages:-

Anaphylactoid reactions.

Contrast-induced nephropathy.

Expensive .

Single contrast method

The bowel filled only with barium, no air introduced.

Double contrast technique

the mucosa is **coated with barium** and the stomach or colon **distended by introducing gas**, often combination with short acting smooth muscle relaxant.

Double contrast shows ***more mucosal detail***

Filling defect
- intraluminal filling defect
- intramural filling defect
-extramural compression

Ulceration
-Benign
-malignant

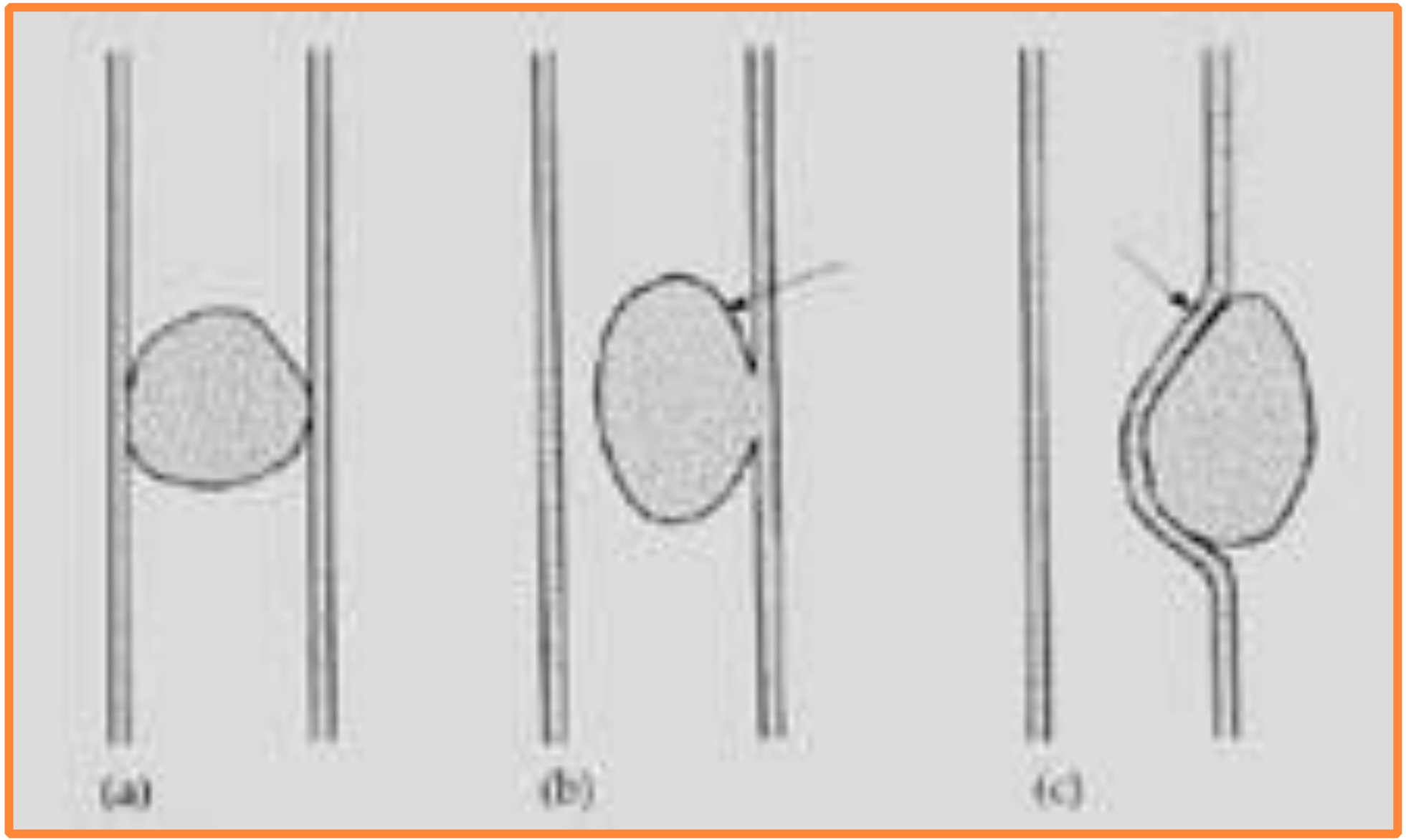
Stricture
-Benign
-malignant

Types of Filling defect

1)-an **intraluminal** filling defect (**food particle**, **stone**) *surrounded by barium all around it.*

2)-an **intramural** filling defect arises from the wall of the bowel (eg: **a carcinoma or leiomyoma**, **diverticulum**,**polyp**) it causes an indentation from one side only and making a sharp angle with the wall and is *not completely surrounded by barium.*

3)-an **extra mural** compression on bowel wall like **enlarged pancreas or lymph nodes**. Also give a narrowing from one side only but make shallow angle with wall, the mucosa is preserved but stretched over the filling defect.


(a)
(b)
(c)

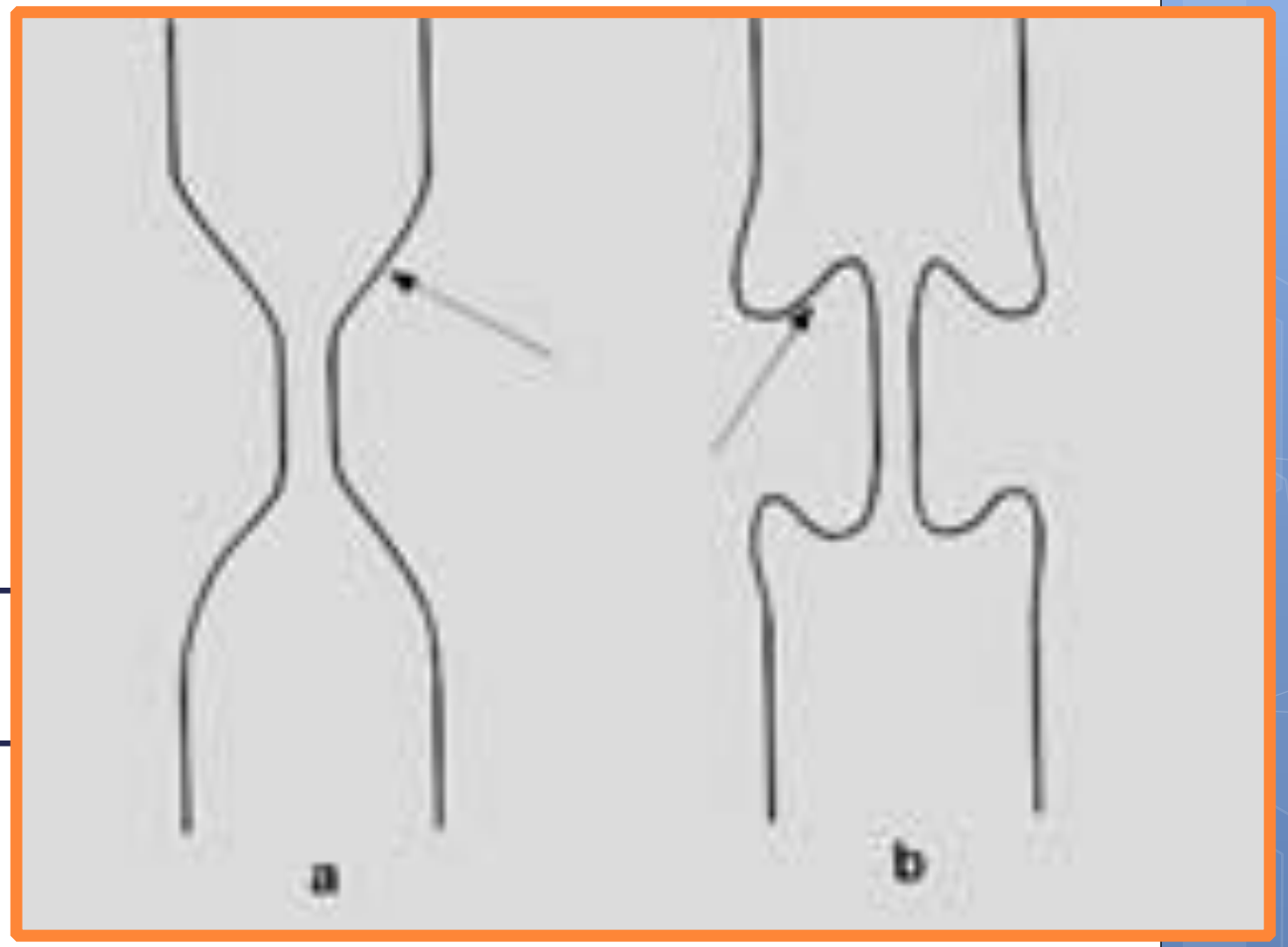
Stricture

A stricture is annular narrowing (must be differentiated from the transient narrowing which occurs with normal peristalsis.

Types:

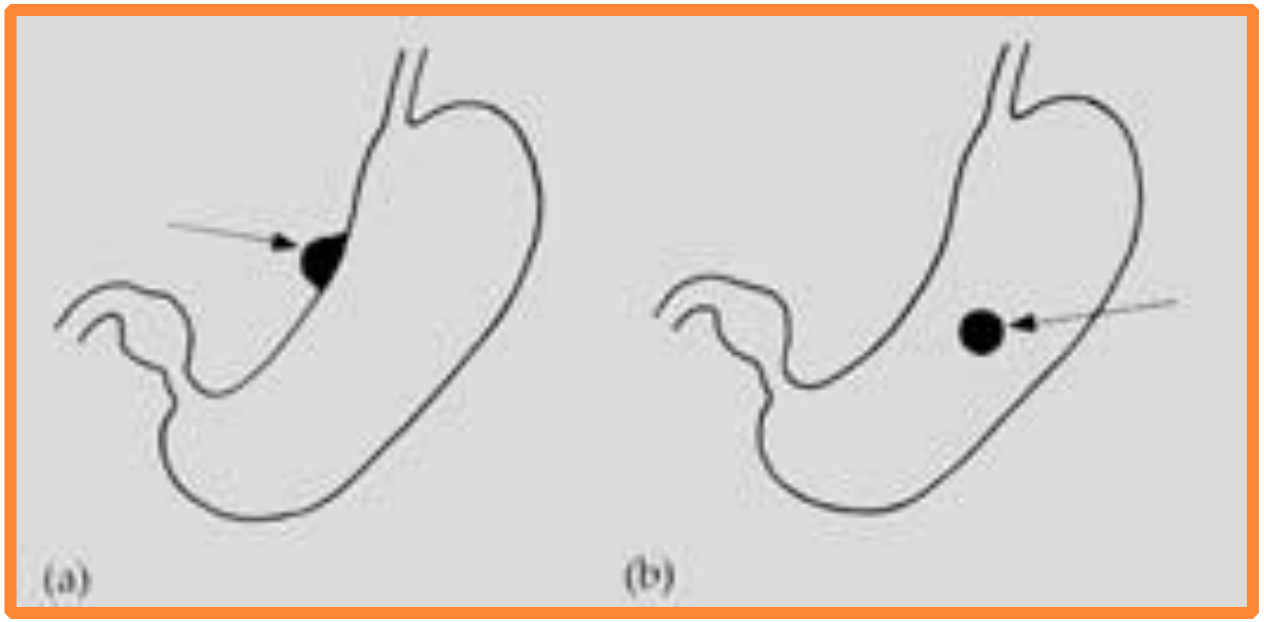
-**smooth tapering ends, regular outline, absence of malignant fx "Benign"**

-**end abruptly and have over hanging edges giving appearance 'shouldering' (shouldering is a feature of malignancy),apple-core "Malignant"**



Ulceration

An ulcer is a breach of a mucosal surface which becomes visible when the crater contains barium.



Benign vs malignant: Look at the surronding

If mucosal folds are lost, featureless leathery appearance… malignant.

Normal gastric rugea … benign

The Esophagus

plain films :

do not normally show the oesophagus unless it is very dilated (eg: achalasia)

but useful to demonstrate F.B.

Barium swallow:

i) oesophagus full with barium to show outline

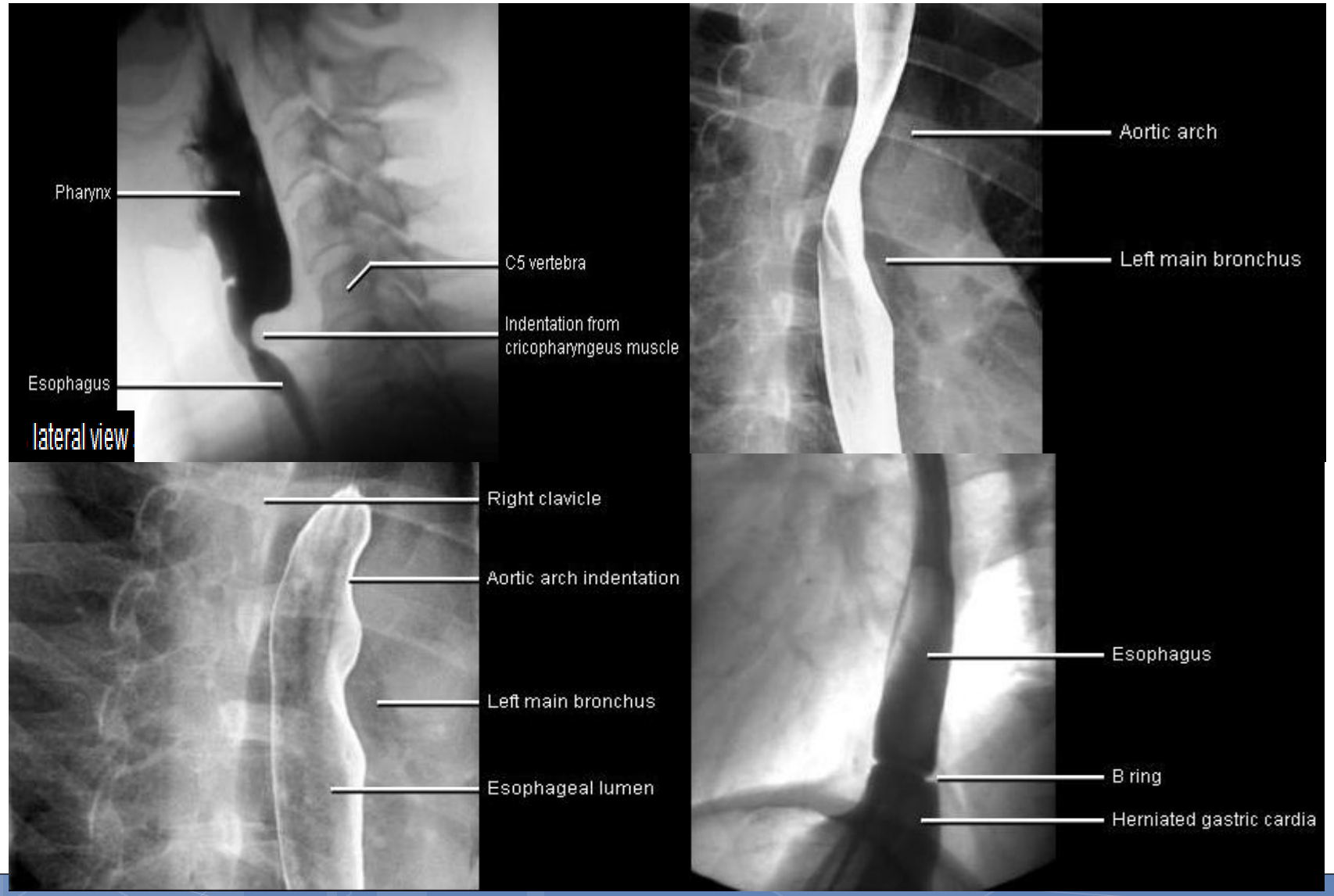
ii) oesophagus empty to show the mucosal pattern.

Normal Impressions on Esophagus

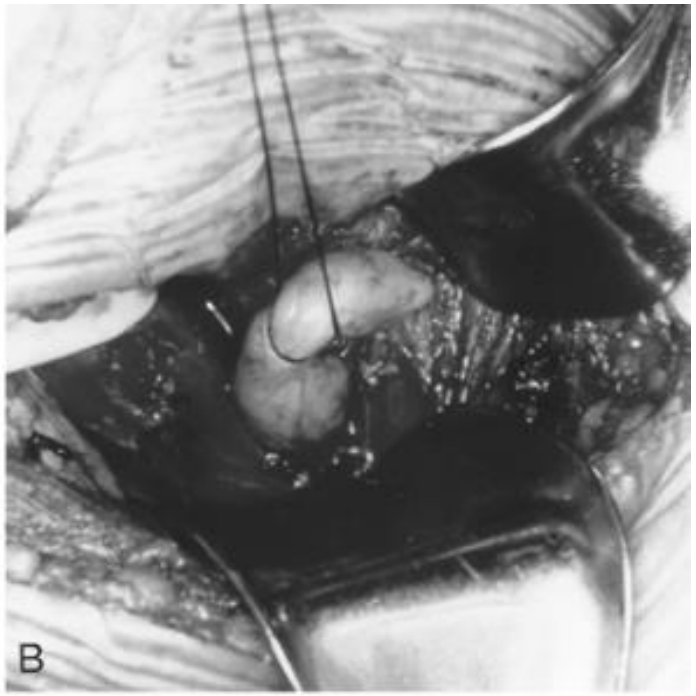
Physiologic areas of narrowing or constriction:

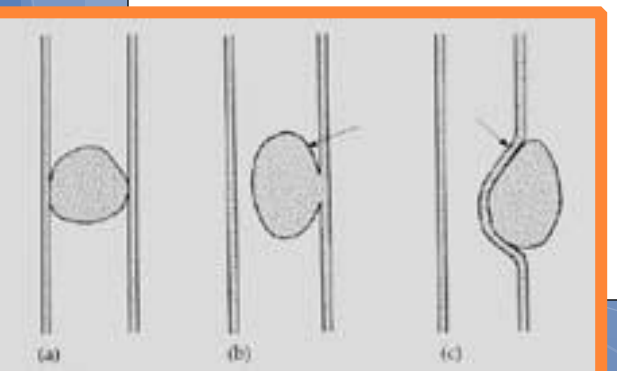
- cricopharyngeus muscle (upper esophageal sphincter) on the posterior aspect of cervical esophagus.
- By arch of aorta (left anterolateral surface of esophagus)
- By left main bronchus
- By diaphragm

Normal Impressions on Esophagus



Filling defects on barium swallow

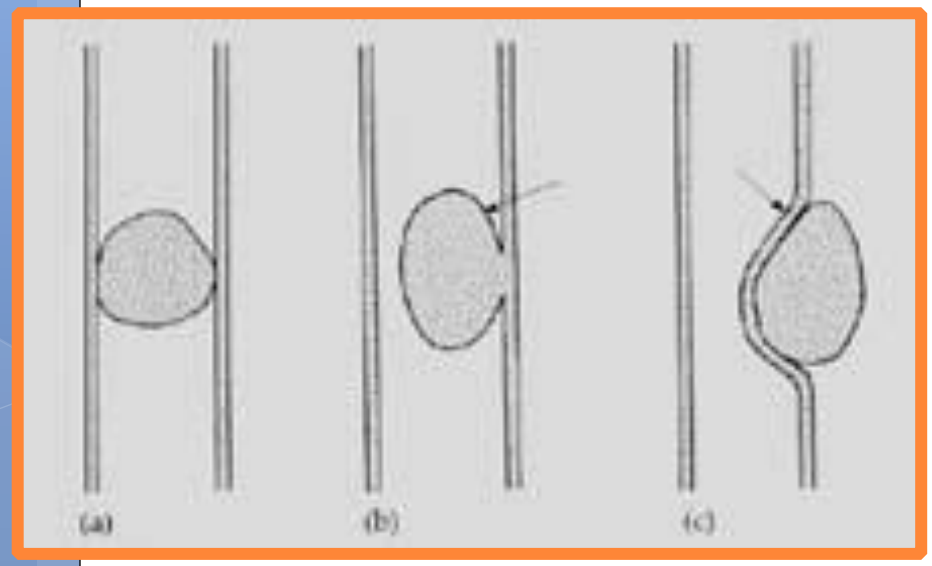




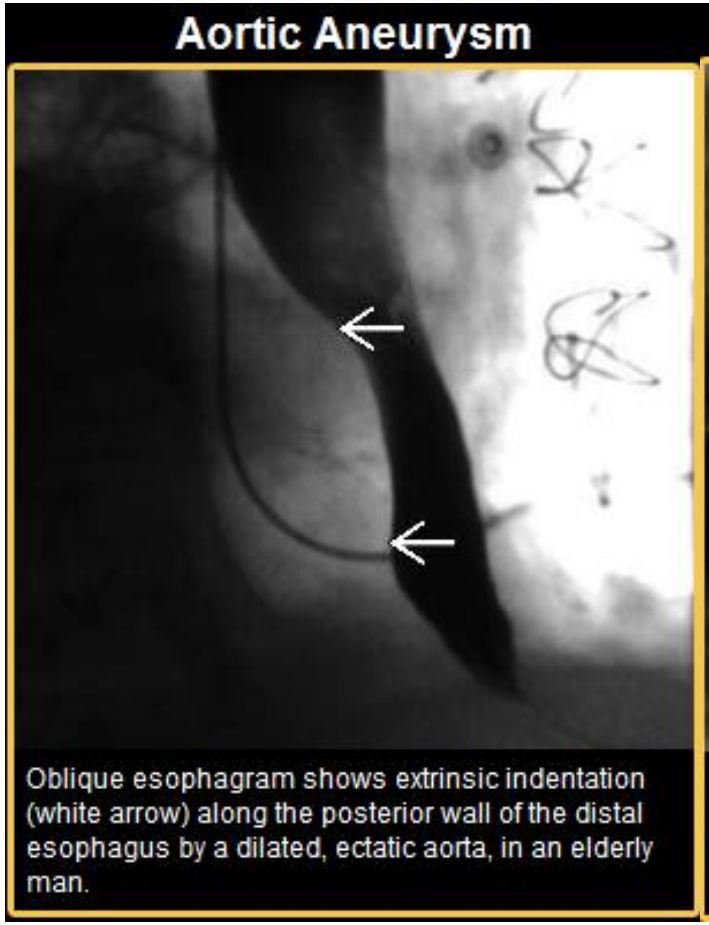
An intramural filling defect

Filling defects on barium swallow

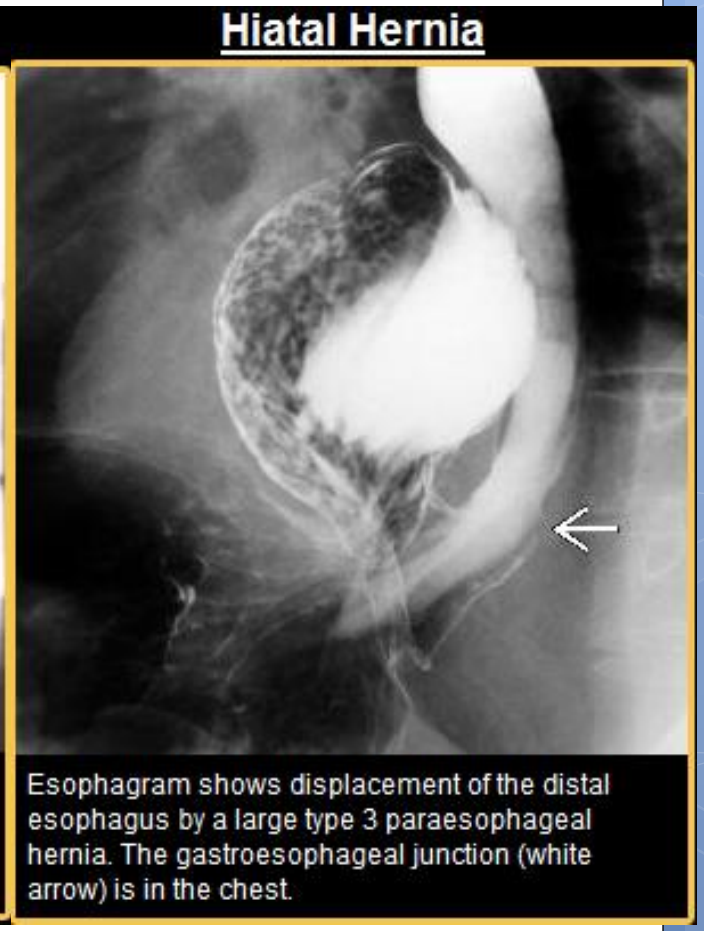
Extrinsic Mass, Esophagus



Extra luminal



Oblique esophagram shows extrinsic indentation (white arrow) along the posterior wall of the distal esophagus by a dilated, ectatic aorta, in an elderly man.



Esophagram shows displacement of the distal esophagus by a large type 3 paraesophageal hernia. The gastroesophageal junction (white arrow) is in the chest.

Abnormal barium swallow

Stricture - main cause of dysphagia

Four main causes of stricture:

1- peptic

2- carcinoma

3- achalasia

4- corrosive

In order to distinguish between these possibilities it is useful to answer the following:

1-where is the stricture?

2-What is the shape?

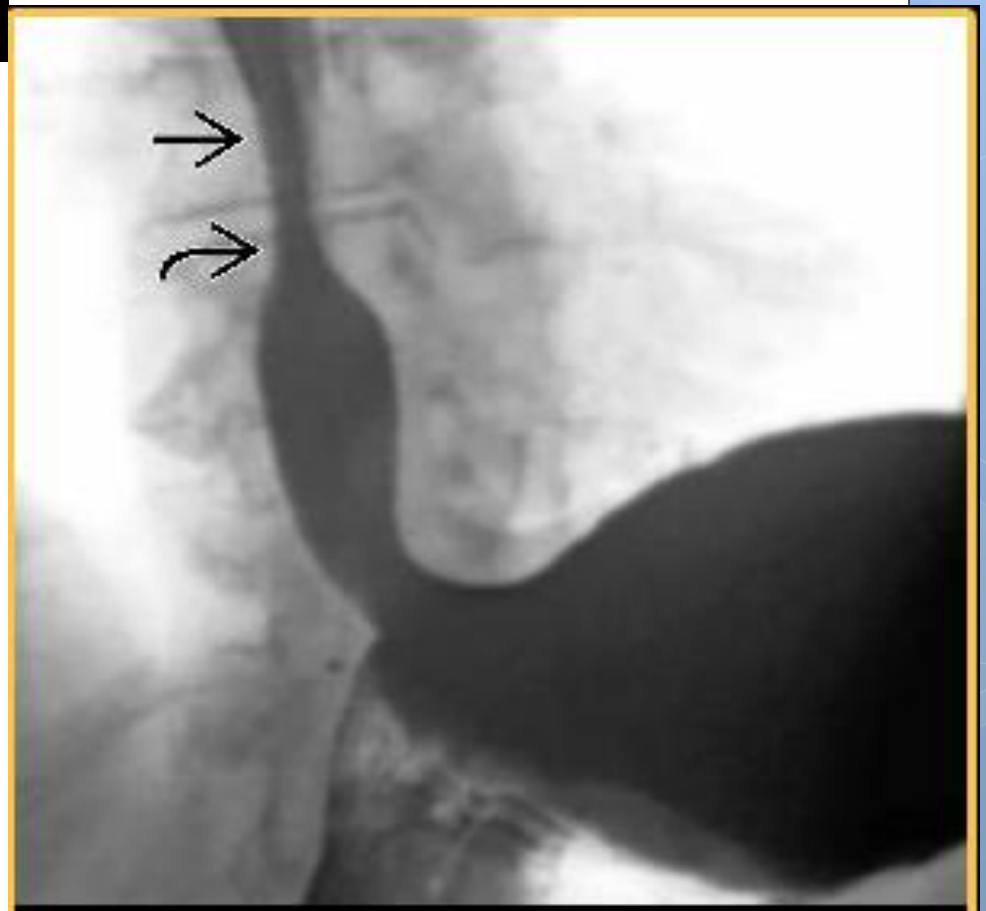
3-How long is it?

4-Is there a soft tissue mass?

Esophagitis, Reflux

Graphic shows a small type 1 ("sliding") hiatal hernia, associated with foreshortening of the esophagus, ulceration of the mucosa, and tapered stricture of the distal esophagus.

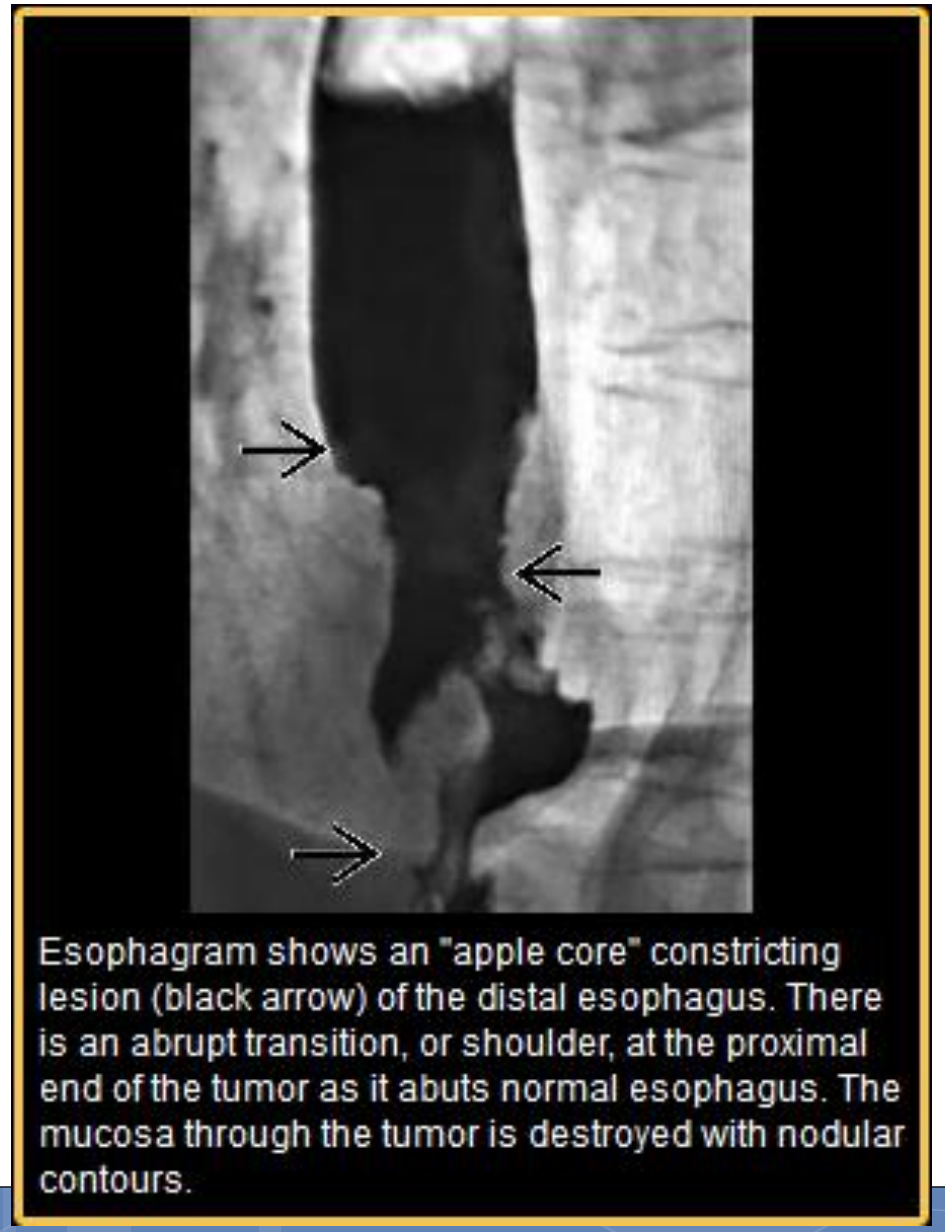
Benign stricture



A supine spot film from a barium esophagram demonstrates free and repeated reflux (black arrow) and a stricture at the gastroesophageal junction (black curved). Tertiary contractions and diminished primary peristalsis were also noted during fluoroscopy.

Esophageal Carcinoma

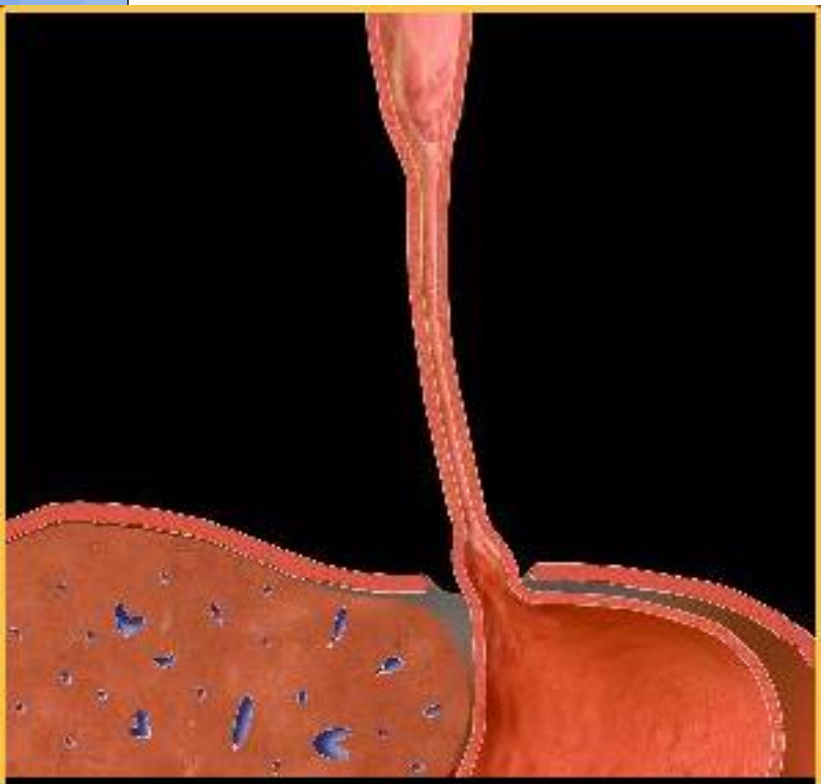
Malignant stricture



Esophagram shows an "apple core" constricting lesion (black arrow) of the distal esophagus. There is an abrupt transition, or shoulder, at the proximal end of the tumor as it abuts normal esophagus. The mucosa through the tumor is destroyed with nodular contours.

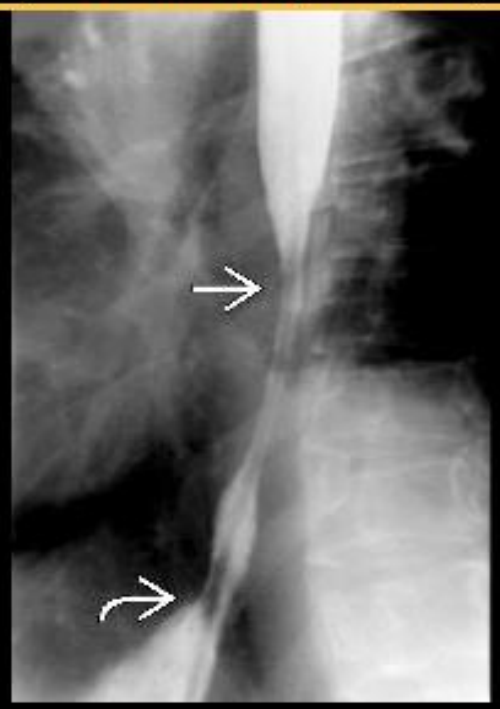
Esophageal Strictures

Benign stricture with esophageal ulceration

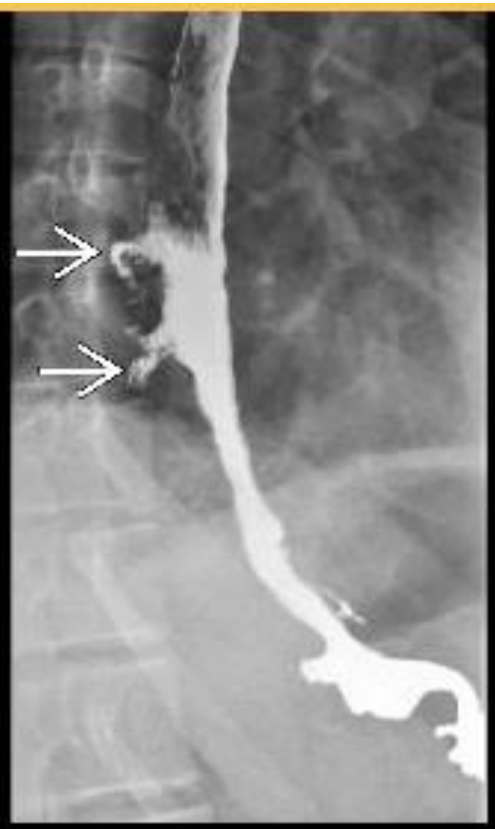


Graphic shows a long stricture of the esophagus and ulceration of the mucosa. The stomach is pulled up into the chest due to foreshortening of the esophagus by fibrosis &/or spasm.

Caustic Esophagitis



Oblique esophagram shows long smooth stricture (white arrow) of distal half of esophagus, with a shortened esophagus causing hiatal hernia (white curved).



Esophagram 1 week following a lye ingestion shows a long stricture with deep ulcerations (white arrow).

Achalasia

Definitions

Primary achalasia: Primary motility disorder of the esophagus (smooth muscle)

Secondary or pseudoachalasia: Involvement of gastroesophageal junction by other abnormalities (Chagas disease, tumor)

Diffuse mediastinal widening with air-fluid level suggests achalasia

Esophagram key to evaluate motility, reflux, and aspiration

Radiographic Findings

Mediastinal widening (double contour)

Marked dilated esophagus

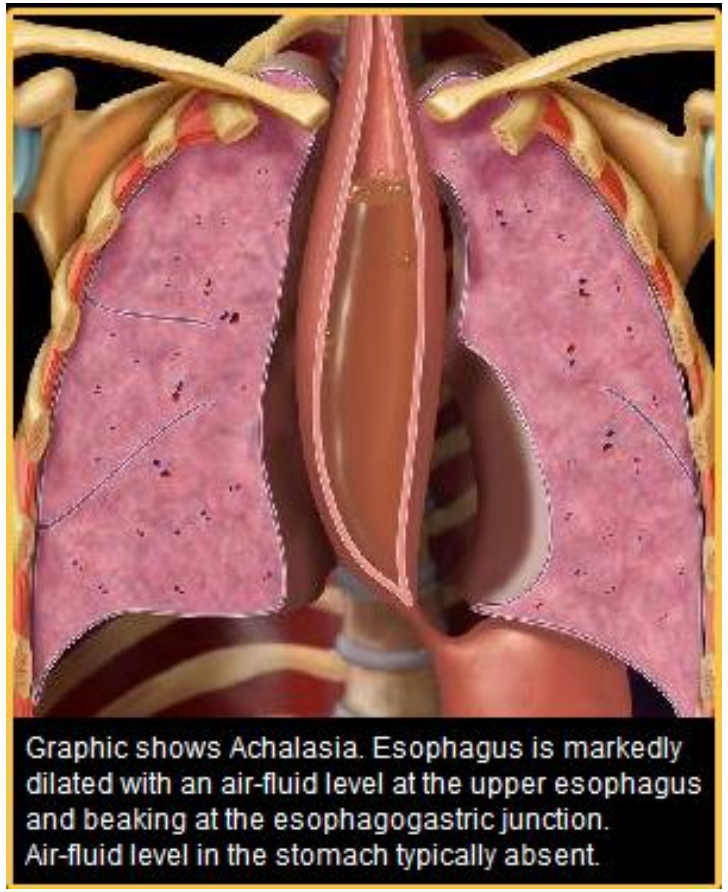
Retro-tracheal air-fluid level

"***Bird-beak" deformity of distal esophagus***

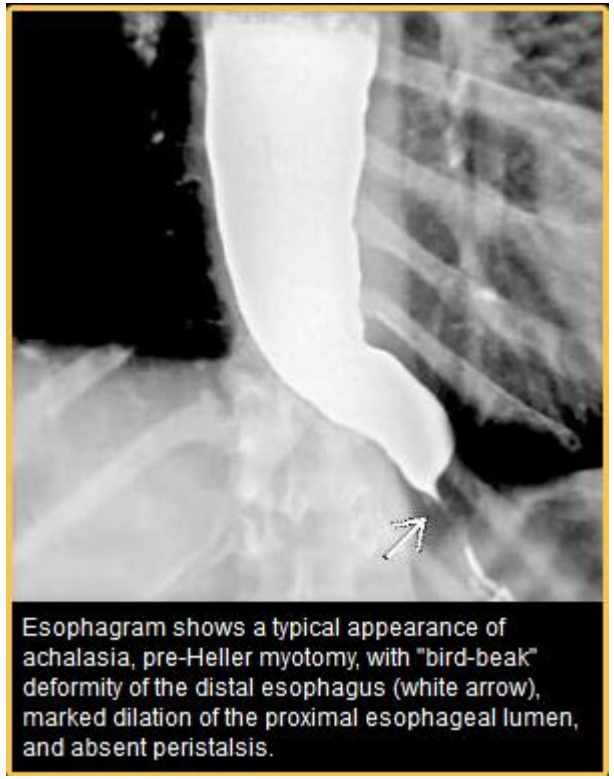
Little or absent gastric air bubble

PA chest radiograph demonstrating a relatively small gas–fluid level in the mediastinum in a patient with achalasia. Note the soft-tissue density mass representing the distended oesophagus inferior to the fluid level

Achalasia, Esophagus

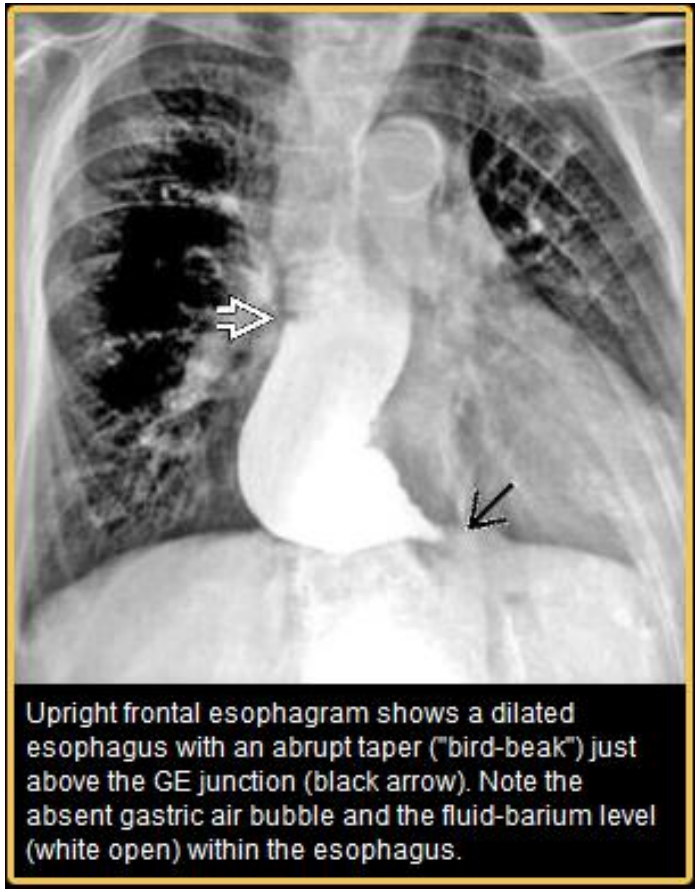


Graphic shows Achalasia. Esophagus is markedly dilated with an air-fluid level at the upper esophagus and beaking at the esophagogastric junction. Air-fluid level in the stomach typically absent.



Esophagram shows a typical appearance of achalasia, pre-Heller myotomy, with "bird-beak" deformity of the distal esophagus (white arrow), marked dilation of the proximal esophageal lumen, and absent peristalsis.

Bird-beak" deformity



Upright frontal esophagram shows a dilated esophagus with an abrupt taper ("bird-beak") just above the GE junction (black arrow). Note the absent gastric air bubble and the fluid-barium level (white open) within the esophagus.


rat tail sign
Achalasia


Bird beak sign
Achalasia

Hiatus hernia

Is a herniation of the stomach into the mediastinum through the oesophageal hiatus in the diaphragm.

2 general types

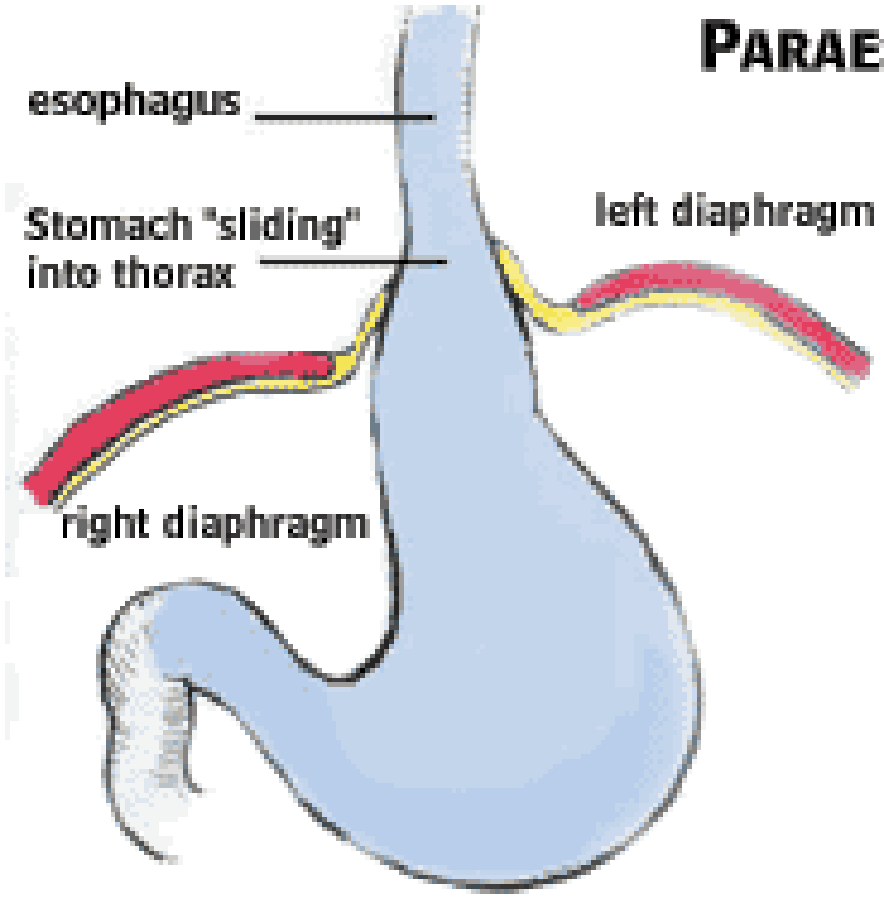
- Sliding (axial) hiatal hernia, **most common***

Gastroesophageal (GE) junction and gastric cardia pass through esophageal hiatus of diaphragm into thorax

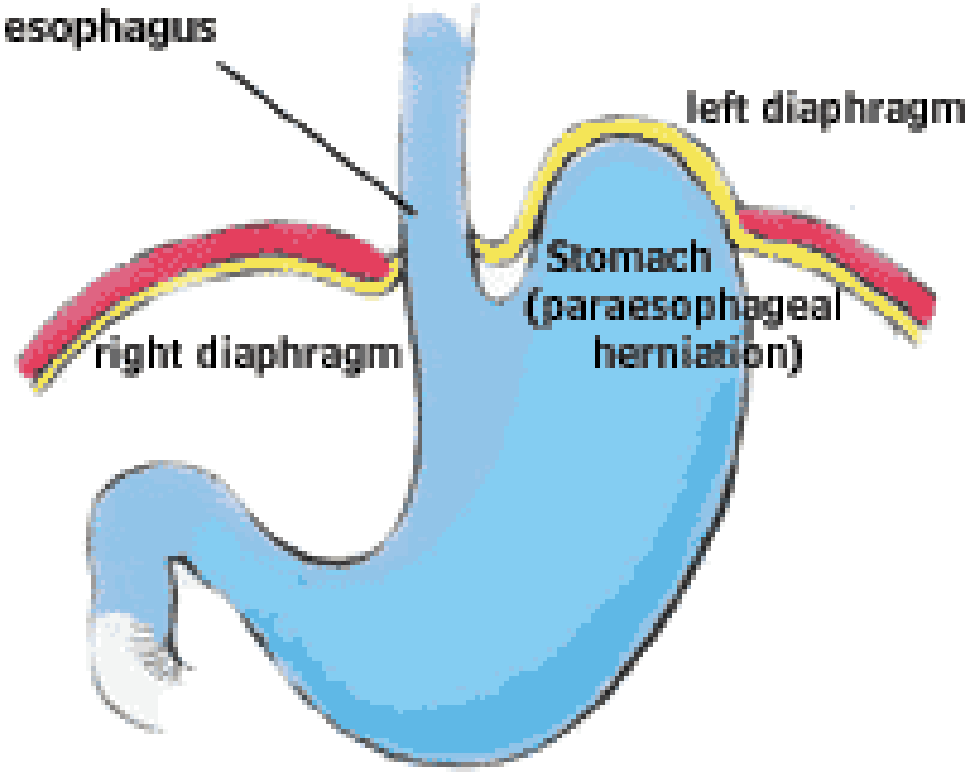
- Paraesophageal (rolling) hernia rare*

Gastric fundus ± other parts of stomach herniate into chest while **GEJ in normal position**.

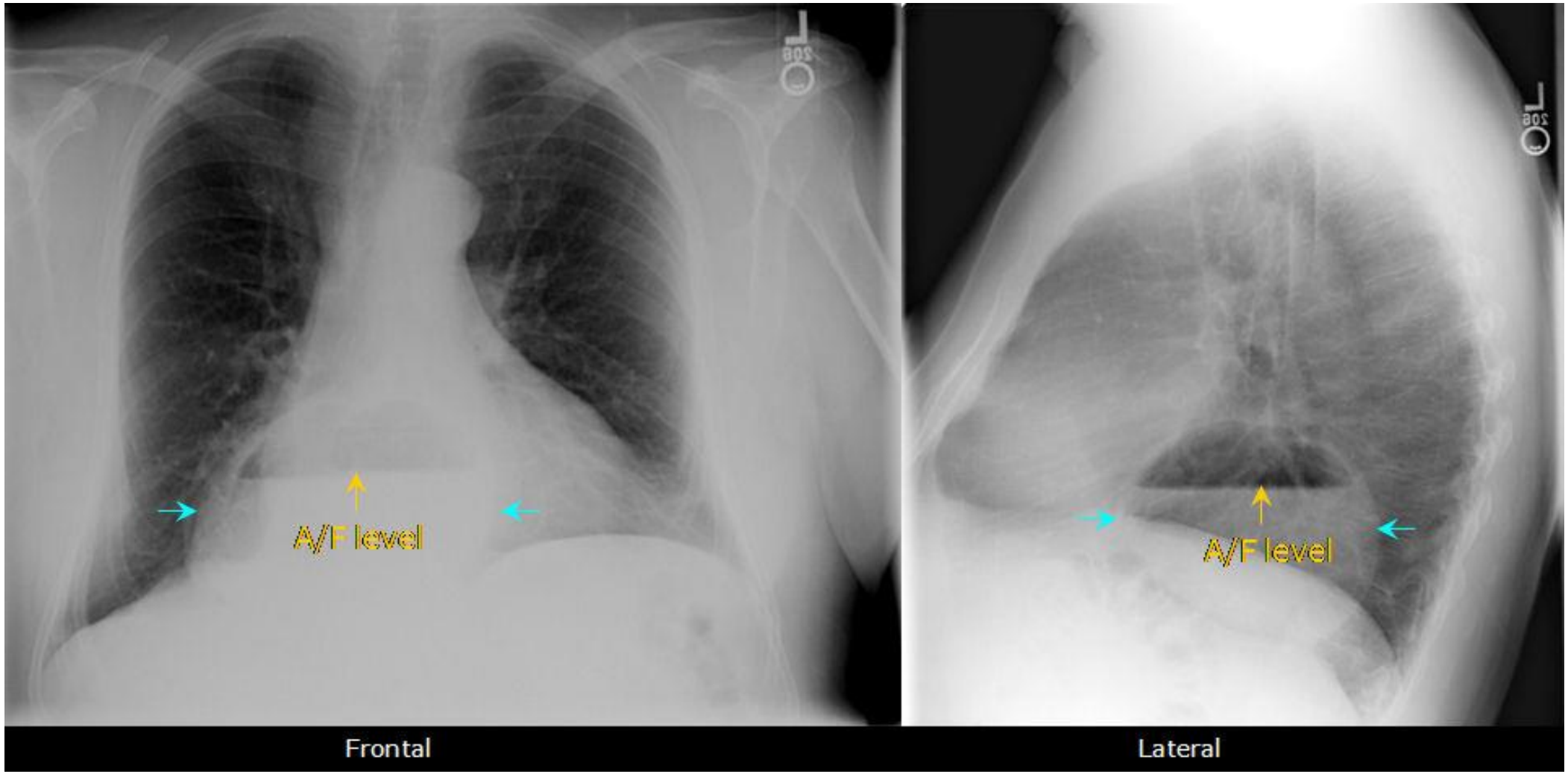
Paraesophageal (Hiatal) Hernia



Type 1. The stomach & intra-abdominal esophagus slide through the diaphragmatic hiatus.



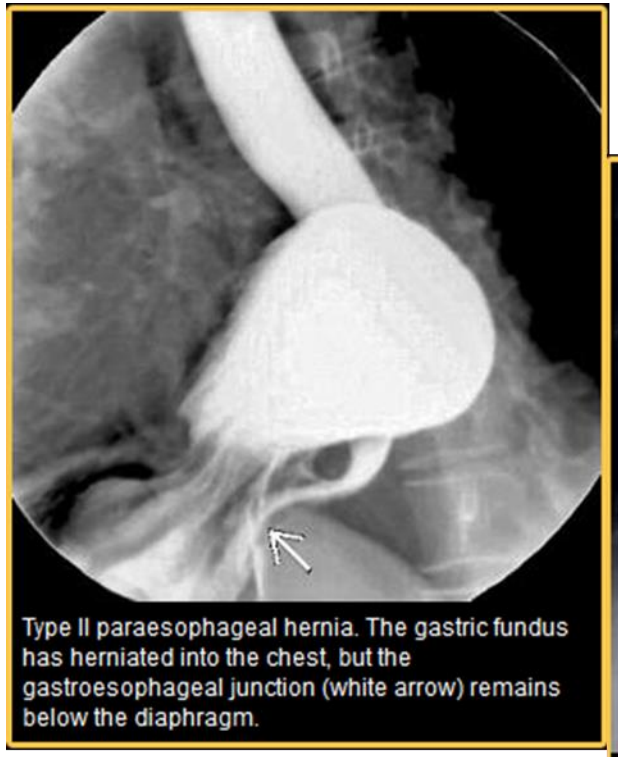
Type 2. The stomach herniates through the diaphragmatic hiatus, adjacent to the esophagus.



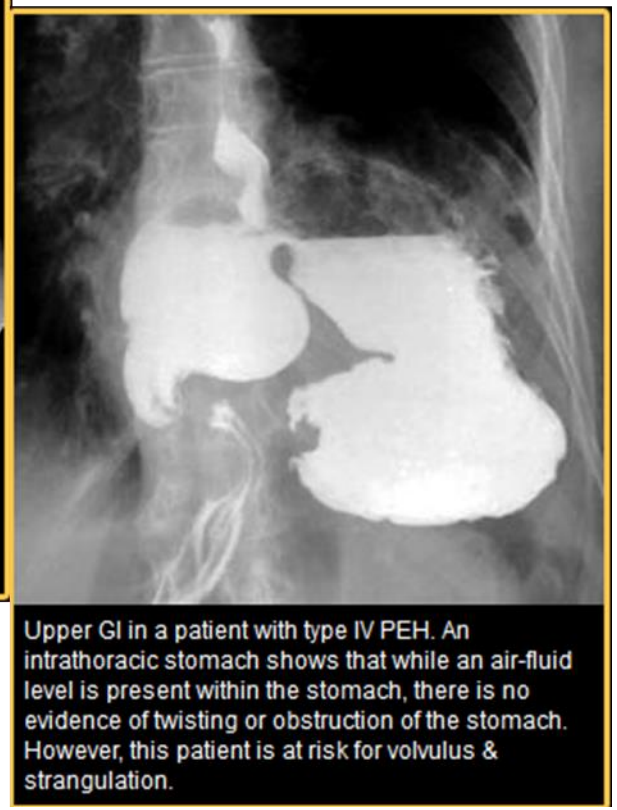
Sliding (axial) hiatal hernia

On conventional xray

Hiatal Hernia

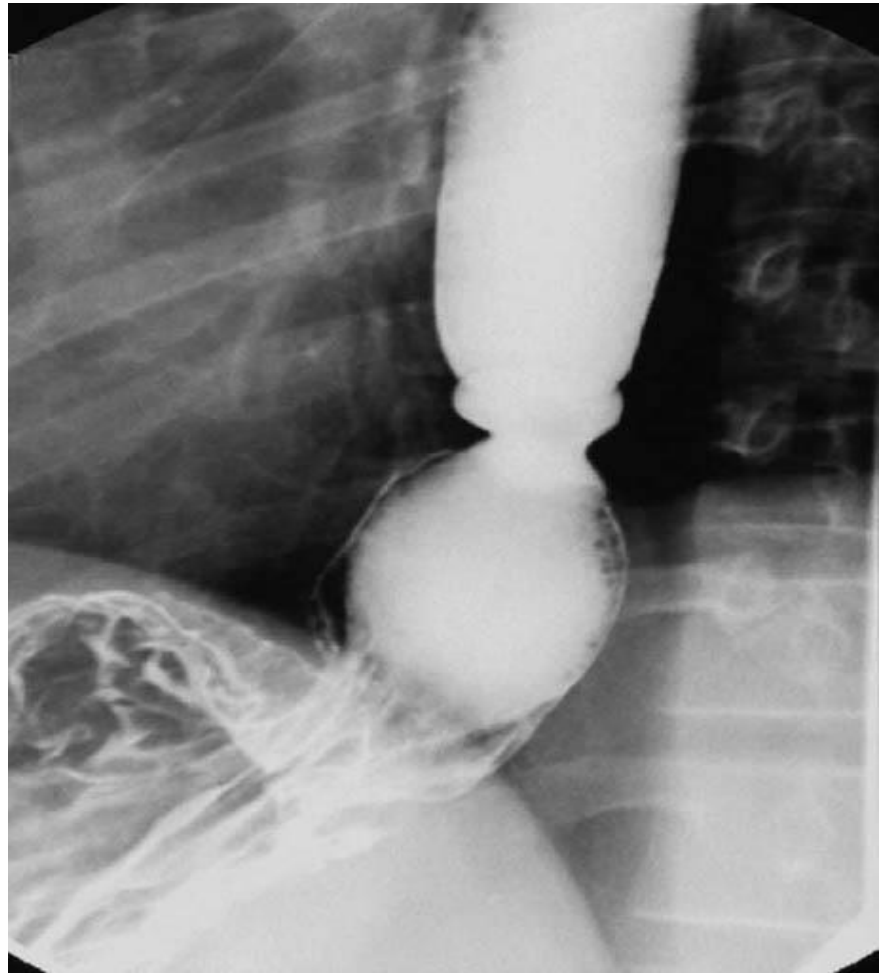


Type II paraesophageal hernia. The gastric fundus has herniated into the chest, but the gastroesophageal junction (white arrow) remains below the diaphragm.



Upper GI in a patient with type IV PEH. An intrathoracic stomach shows that while an air-fluid level is present within the stomach, there is no evidence of twisting or obstruction of the stomach. However, this patient is at risk for volvulus & strangulation.

Paraesophageal hernia



Sliding hiatal hernia

The stomach and duodenum

Barium meal is the standard contrast medium to examine the stomach and duodenum.

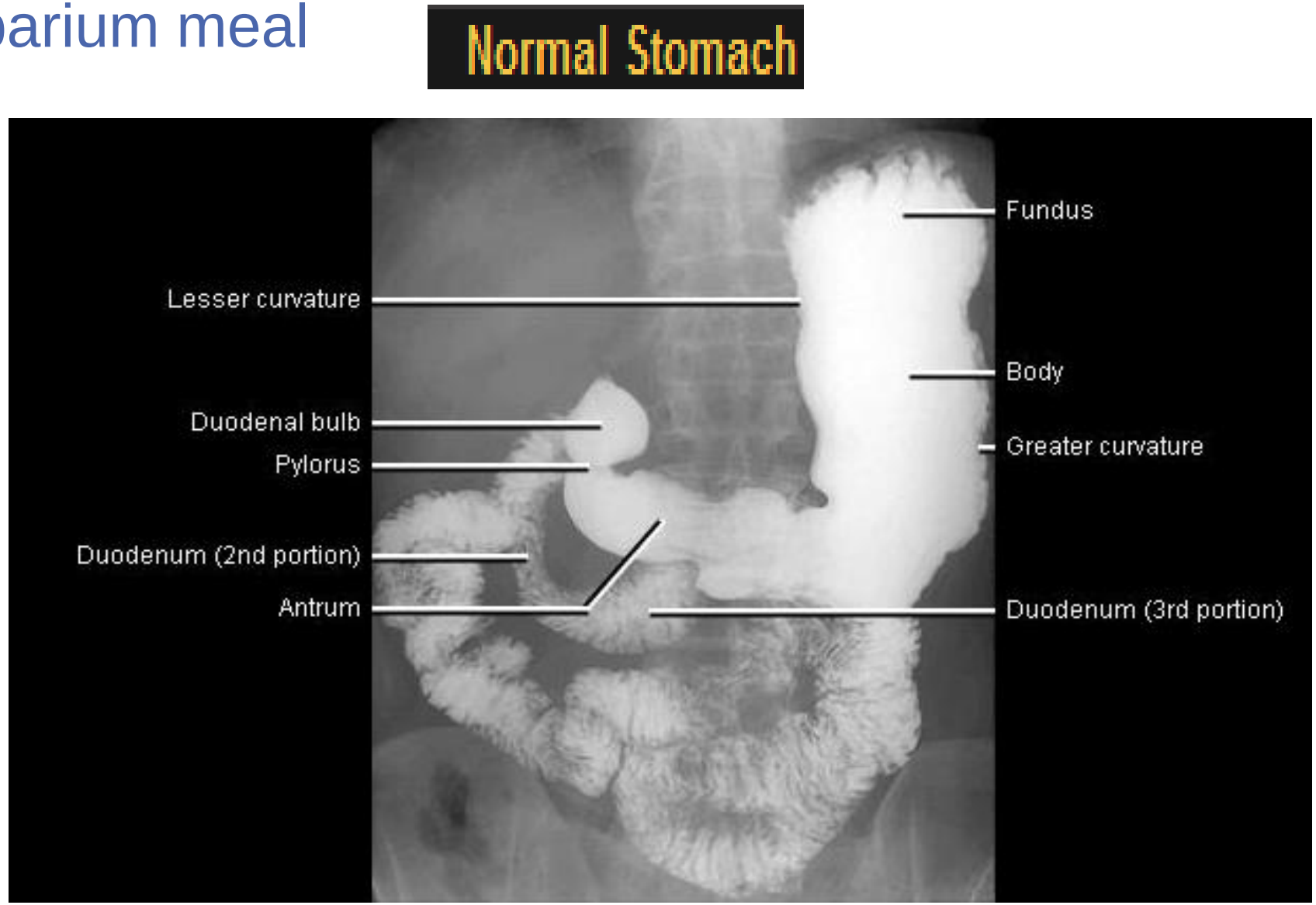
Patient drinks about 200 ml of barium.

Better mucosal detail, the stomach is distended by giving a gas producing agent .

Intravenous injection of a short acting smooth muscle relaxant

Fasting patient for at least 6 hours.

Normal barium meal



Abnormal barium meal

Intraluminal defects:

-food or blood

-hair forming ball or bezoar

Polyps:

-Single or multiple, sessile or have a stalk.

Polyps classified into 3 types based on pathology

Hyperplastic, adenomatous, & hamartomatous

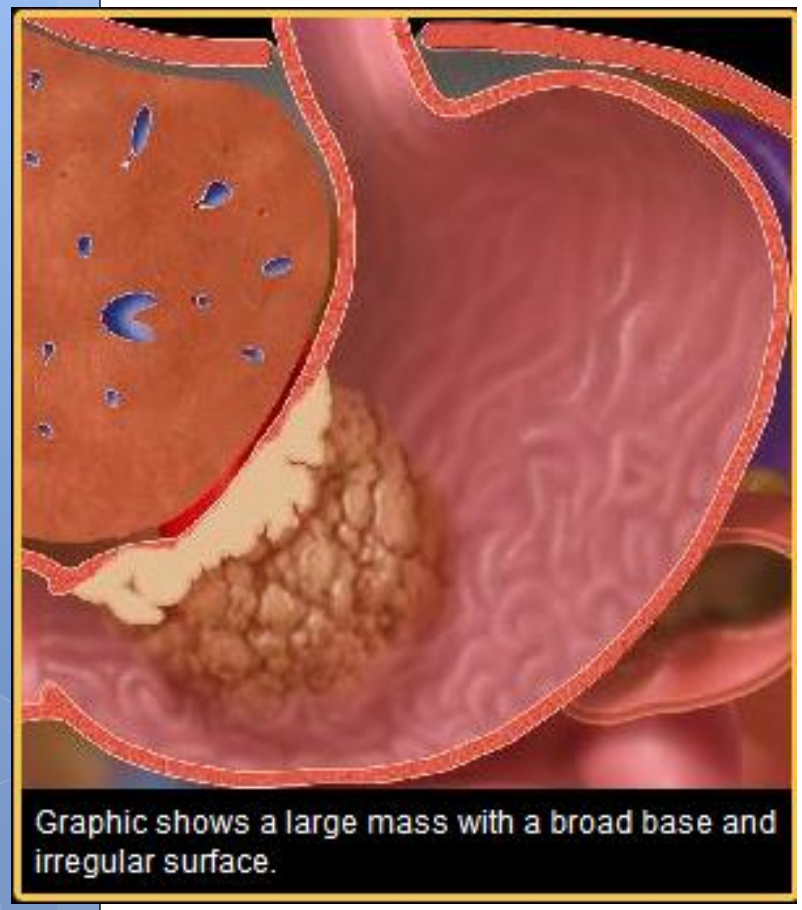
Carcinoma:

- **produce an irregular filling defect with alteration of mucosal pattern**

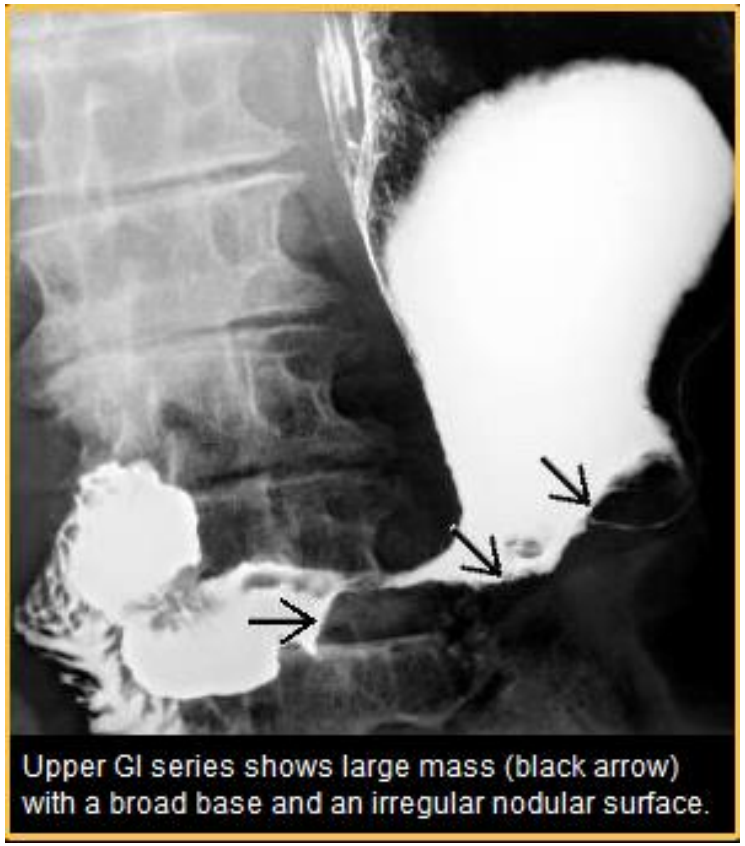
-carcinoma diffusely involving the stomach is known as linitis plastica ("leather bottle"): Irregular narrowing/rigidity

.

Gastric Carcinoma



Graphic shows a large mass with a broad base and irregular surface.



Upper GI series shows large mass (black arrow) with a broad base and an irregular nodular surface.

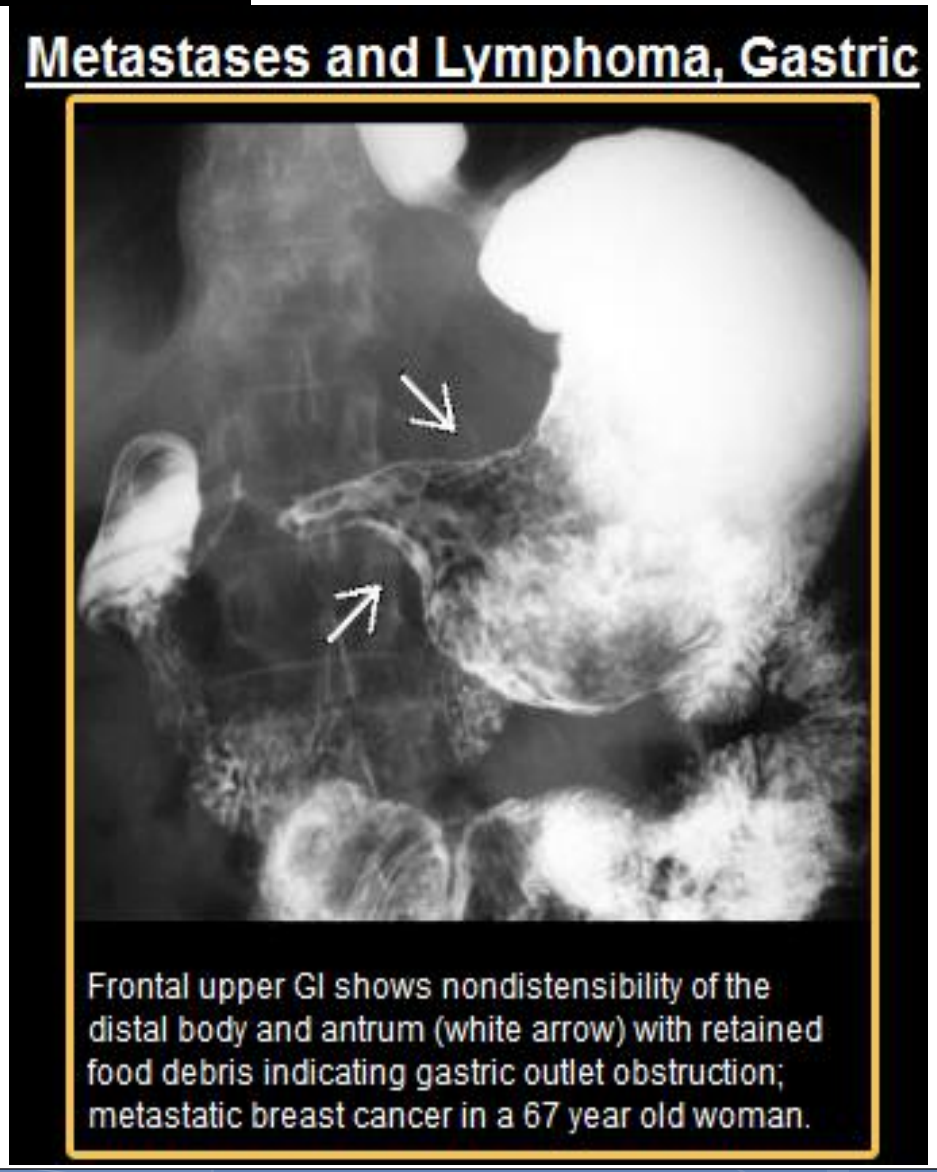
Upper GI series shows a mass (white arrow) as a filling defect in the barium pool on this supine film.

Linitis Plastica, Limited Distensibility

Gastric Carcinoma

Upper GI shows a remarkably contracted and nondistensible stomach (white arrow) due to diffusely infiltrative gastric carcinoma, a classic linitis plastica appearance in an 82 year old man.

Metastases and Lymphoma, Gastric



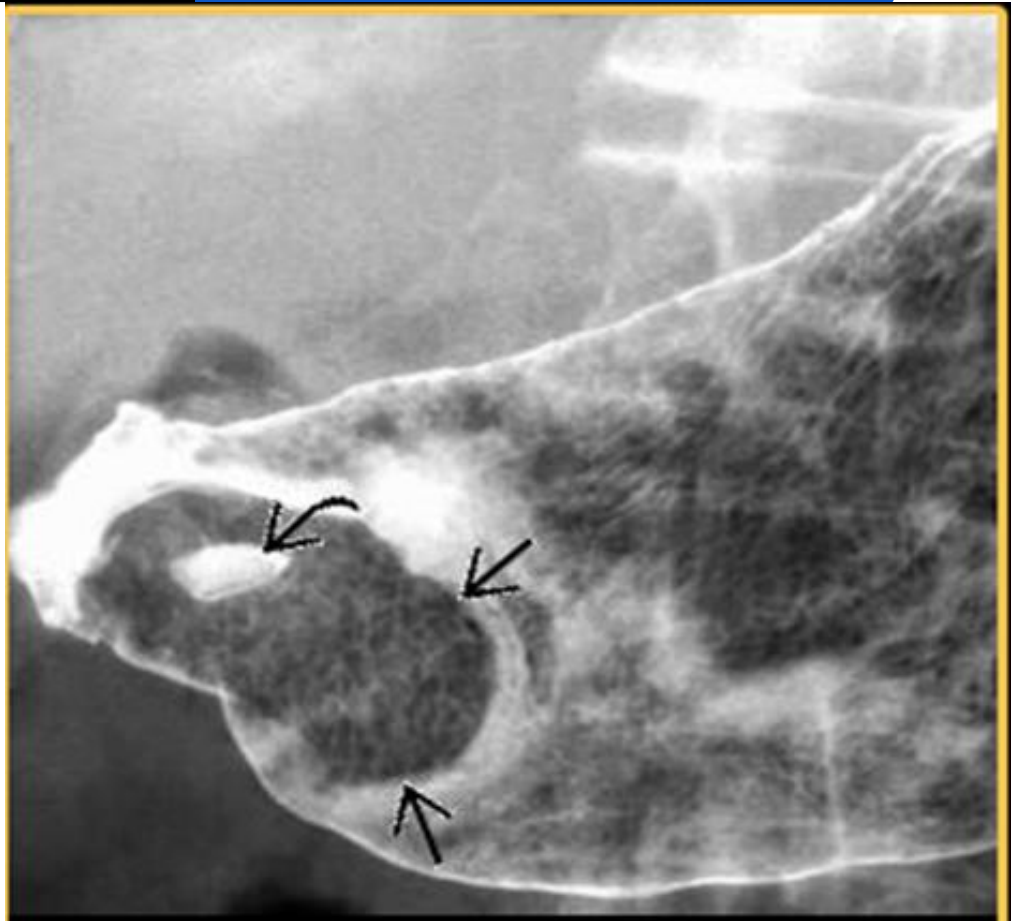
Frontal upper GI shows nondistensibility of the distal body and antrum (white arrow) with retained food debris indicating gastric outlet obstruction; metastatic breast cancer in a 67 year old woman.

GIST, Gastric

Anatomic depiction of a gastric stromal tumor shows an exophytic submucosal mass (white arrow) with internal necrosis.

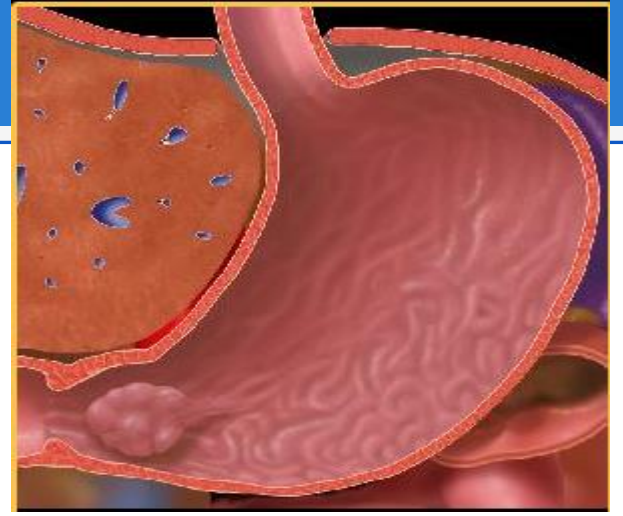
Intramural filling defect.

Mass with ulcer

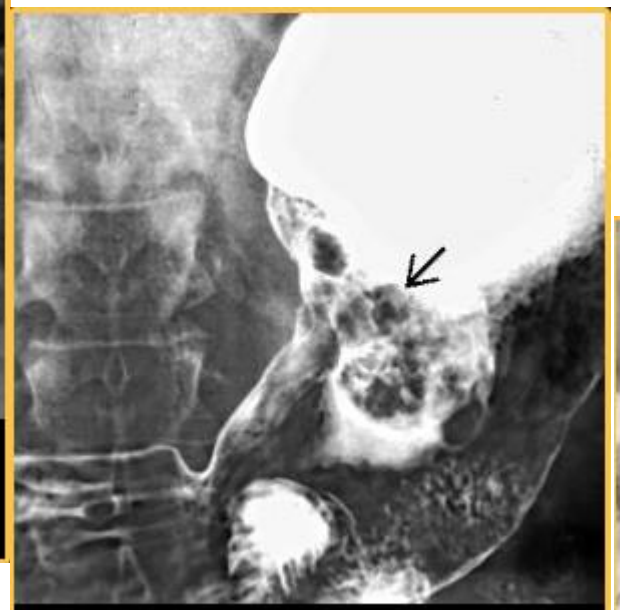


Upper GI series shows a gastric antral mass (black arrow) with a central ulceration (black curved), typical of a gastric GIST. Note the otherwise intact mucosa over the mass, even with preservation of the areae gastricae.

Gastric Polyps



Film from an upper GI series in a 57-year-old man shows multiple small, sessile polyps (white arrow) in the gastric body. The appearance and age of the patient are typical for hyperplastic polyps.

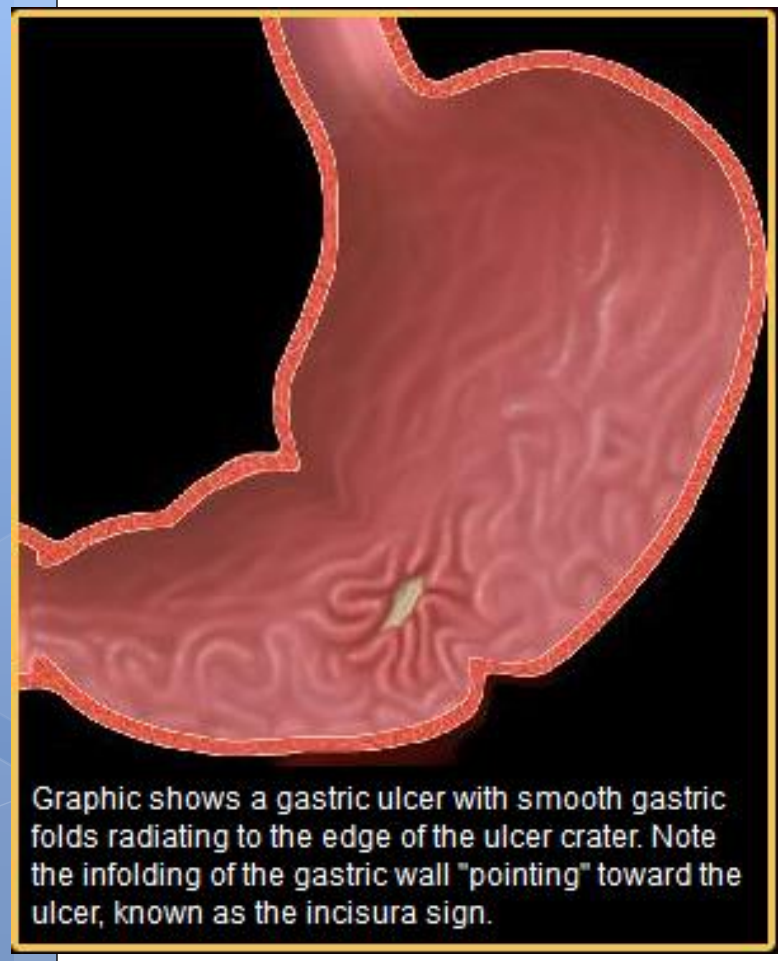


Upper GI series shows a large adenomatous gastric polyp (black arrow).

an upper GI series demonstrate innumerable polyps (

Hamartomatous Polyposis (Peutz-Jeghers Syndrome)

Gastric Ulcer



Graphic shows a gastric ulcer with smooth gastric folds radiating to the edge of the ulcer crater. Note the infolding of the gastric wall "pointing" toward the ulcer, known as the incisura sign.

Upper GI series shows barium pool in ulcer crater (white arrow) with smooth folds radiating to the edge of the ulcer.

Gastric Carcinoma

Upper GI shows a large antral ulcer (white arrow) (fixed collection of barium). The surrounding mass is less evident, although fluoroscopy showed a stiff, nonperistaltic distal body and antrum that was found to be a large carcinoma at surgery.

Distinguishing features between benign and malignant gastric ulcer

BENIGN ULCER

1-the ulcer projects beyond the lumen of the stomach.

2-the edge of the ulcer is **regular** and round when seen enface

3-usually on lesser curve, rarely on greater curve

4-radiating mucosal folds reach or near to the edge of the ulcer

MALIGNANT ULCER

1-the ulcer occurs within an **irregular filling defect**.

2-the edge of the ulcer is irregular

3-occure any where but ulcer on antrum and on greater curve are suspicious

4-the **mucosal folds are obliterated** some distance from the edge of the ulcer

The small intestine

The standard contrast examination for the small intestine is the barium, ***small bowel follow-through***.

The patient drinks about 200 – 300 ml of barium and its passage through the small intestine is observed by taking films at regular intervals until the barium reaches the colon.

Transit time is very variable.
Patient lying prone during filming.

The normal barium follow-through

The small intestine occupies the central and lower abdomen, usually framed by the colon.

The terminal ileum enters the medial aspect of the caecum through the ileocacal valve.

The small bowel diameter is normally not more than 25 mm.

Transverse folds of mucous membrane project in lumen of the bowel and barium lies between theses folds ,which appear a lucent filling defects of about 2-3 mm in width (volvulae conniventes).

The mucosal folds are largest and most numerous in the jejunum stand to disappear in the lower part of the ileum.

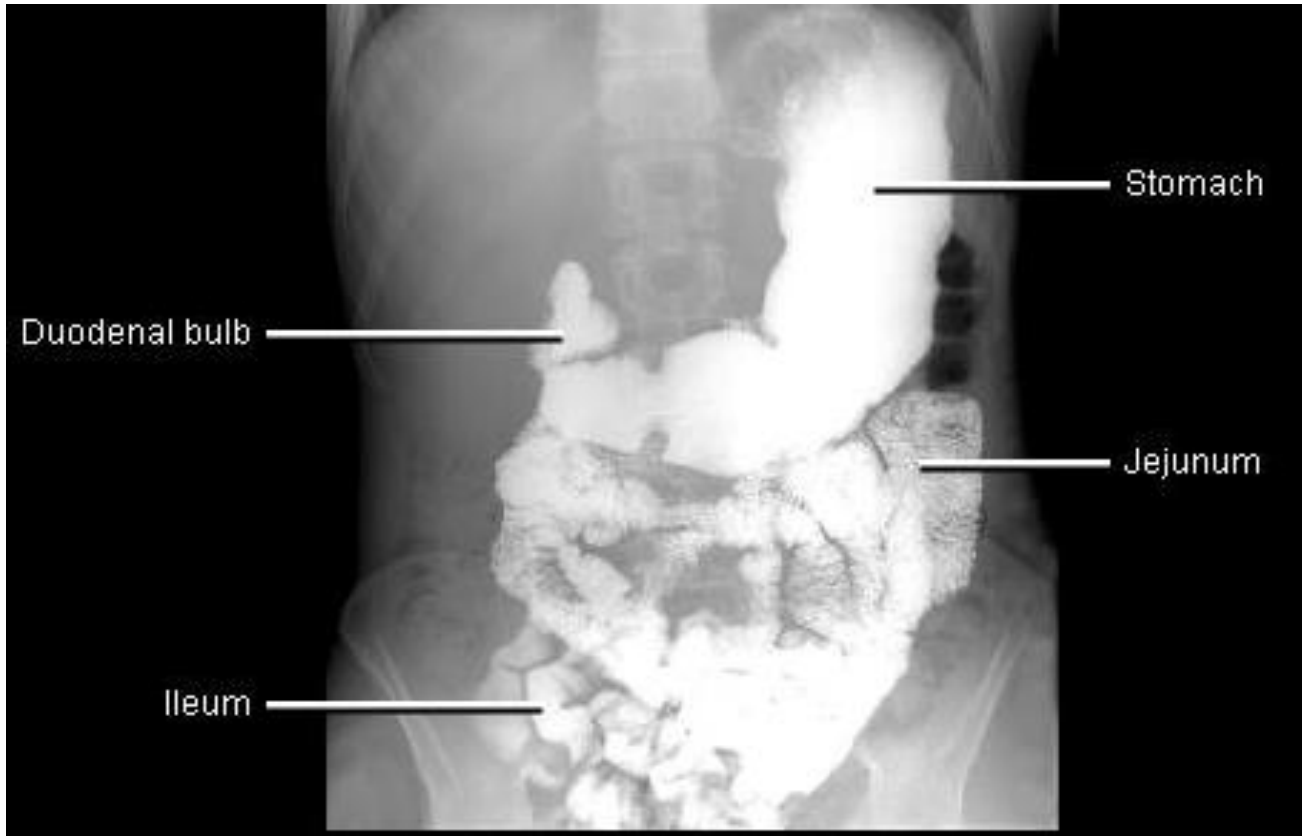
small bowel enema

An alternative method of examining the small bowel is the so-called small bowel enema (enteroclysis) which distends the bowel and gives excellent mucosal detail.

The technique is appropriate for structural deformities eg: Chron's disease or tumour.

Not used for malabsorption syndromes.

Enteroclysis, Normal Small Intestine



The abnormal barium follow-through

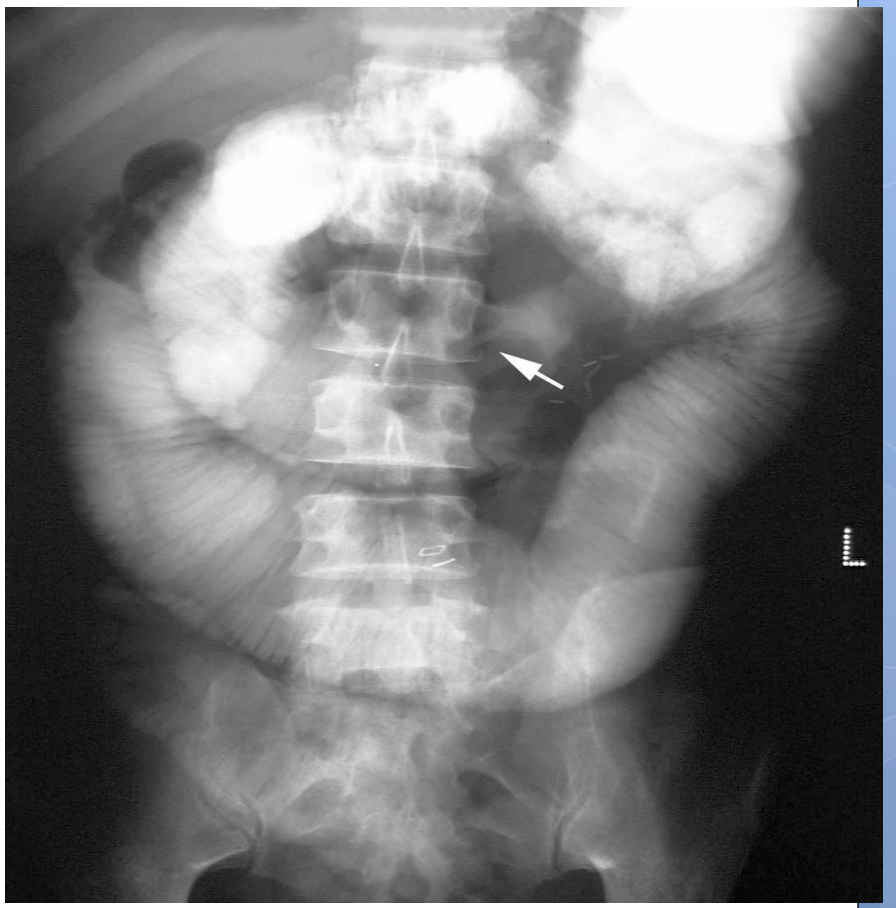
Dilation:

- over 30 mm is definitely abnormal.

  Indicates: malabsorption

  Paralytic ileus

  Small bowel obstruction.



Water-soluble contrast upper GI examination in a patient with clinical features of small-bowel obstruction and a history of surgery for large bowel cancer. The contrast-enhanced study shows dilated loops of small bowel, with stretching of the mucosal folds and a narrowed segment ending in a beak (arrow). At surgery, a small-bowel obstruction from extrinsic compression was found to be the result of mesenteric metastases.

The abnormal barium follow-through

Mucosal abnormality

The folds become thickened in many conditions
eg:

-malabsorption starts with oedema and haemorrhage in the bowel wall.

-Inflamed.

-Infiltrated.

Narrowing

Common causes are :

-Crohn's disease

-Tuberculosis

-Lymphoma

-Strictures do not contain normal mucosal folds and usually result in dilation of the bowel proximally.

-Normal narrowing caused by peristaltic waves.

The abnormal barium follow-through

Alteration in position

Congenital malrotation, common in this condition volvulus associated with abnormal mesenteric attachments.

Displacement by mass.

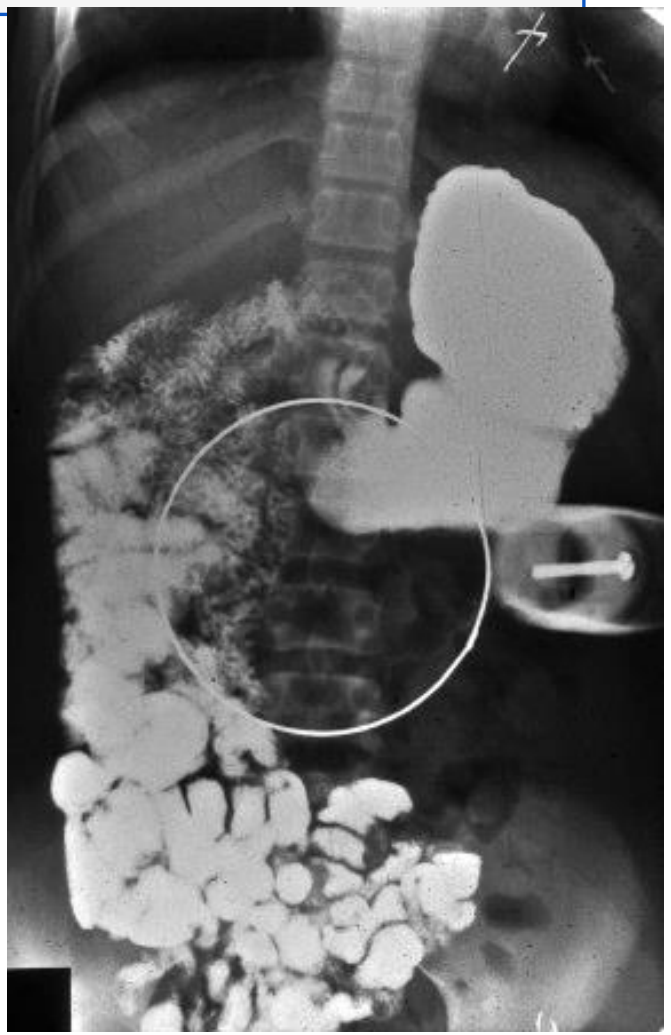
Ulceration

The outline of the small bowel should be smooth.

ulcers appear as spikes projecting outwards which may be shallow or deep.

Seen in Crohn's disease, tuberculosis, lymphoma.

A cobblestone appearance (combination between ulceration and mucosal oedema).



Upper GI contrast study showing a malrotation with lack of normal C-shaped duodenum and the small bowel "hanging" on the right side of the abdomen.

Large intestine

- single contrast technique
double contrast technique -

Washout is most important to rid the colon of the faecal material which might otherwise mask small lesions and cause confusion by simulating polyps.

Calibre decrease from caecum to the sigmoid colon.
Lips of iloecaecal valves

Haustra can usually be recognised in the whole of the colon as though may be absent in the descending and sigmoid regions.

The abnormal barium enema

Narrowing of the lumen; spasm often seen in normal patient or in conjunction with diverticular disease, inflammatory disorders abolished by IV smooth muscle relaxant eg: buscopan, glucagons.

Strictures : main causes:

-carcinoma
-diverticuar disease
-Crohn's disease
-Ischaemic colitis

Different types of strictures

- Neoplastic stricture - Shouldered edges, an irregular lumen and rarely more than 6 cm.

- Benign stricture have tapered ends, relatively smooth outline and may be any length.

- ***Site*** of stricture can help limiting to the D/D.
- Diverticular disease are almost always confined to the sigmoid colon.
- Ischaemic strictures are usually confined between splenic flexure and the sigmoid colon.
- Crohn's disease and tuberculosis have prediection for the caecum.

The abnormal barium enema

Dilation

Causes of dilation of the colon are:
-obstruction
-paralytic ileus
-volvulus
-ulcerative colitis with toxic dilation
-Hirschsprungis disease and megacolon

Filling defects

- polyps.
- neoplasm
- faeces (surrounded by barium and freely moveable) so all enema should be done to clean the colon.

Ulceration

Two major causes of the Ulcers of the colonic mucosa
-ulcerative colitis
-crohn's disease

Crohn Disease

is an idiopathic inflammatory bowel disease (IBD), characterised by widespread gastrointestinal tract and systemic involvement.

Epidemiology

The diagnosis is typically made between the ages of **15 and 25 years** of age, with no gender predilection 5. There is a **familial** component and incidence also varies with geographical location.

Clinical presentation

Clinical presentation is typically with **chronic diarrhoea and recurrent abdominal pain**. Alternatively patients may present with one of the many complications or extraintestinal manifestations (see below).

Pathology

Crohn's disease remains **idiopathic**, although infective agents have been gaining in popularity as possible candidates, including the measles virus and atypical mycobacterium. As there are definite genetic factors at play, multiple factors are likely to contribute 1.

Extraintestinal manifestations include:

skin
erythema nodosum
pyoderma gangrenosum
joints
arthritis
ankylosing spondylitis
sacroiliitis
eyes
episcleritis
iritis
uveitis

- liver and biliary system
  - pericholangitis
  - primary sclerosing cholangitis (PSC) (more common in ulcerative colitis)
  - autoimmune hepatitis
  - cirrhosis
  - gallstones, seen in 30 - 50% 8
  - hepatic abscess 8
  - pancreatitis
- renal tract : renal calculi containing oxalate

Radiographic features

The characteristic of Crohn's disease is the presence of **skip lesions**.

The frequency with which various parts of the gastrointestinal tract are affected varies widely 5:

small bowel : 70 - 80 % 5-6

small and large bowel : 50 %

large bowel only : 15 - 20 %

Barium small bowel follow-through:

mucosal ulcers

aphthous ulcers or deeper transmural ulcers

typically either longitudinal or circumferential in orientation

when severe leads to cobblestone appearance

may lead to sinus tracts and ***fistulae***

widely separated loops of bowel due to fibro-fatty proliferation (creeping fat) 2

thickened folds due to oedema

partial obstruction

CT

fat halo sign

comb sign

bowel wall enhancement

bowel wall thickening (1 - 2cm) which is most frequently seen in the terminal ileum (present in up to 83% of patients) 8.

strictures and fistulae

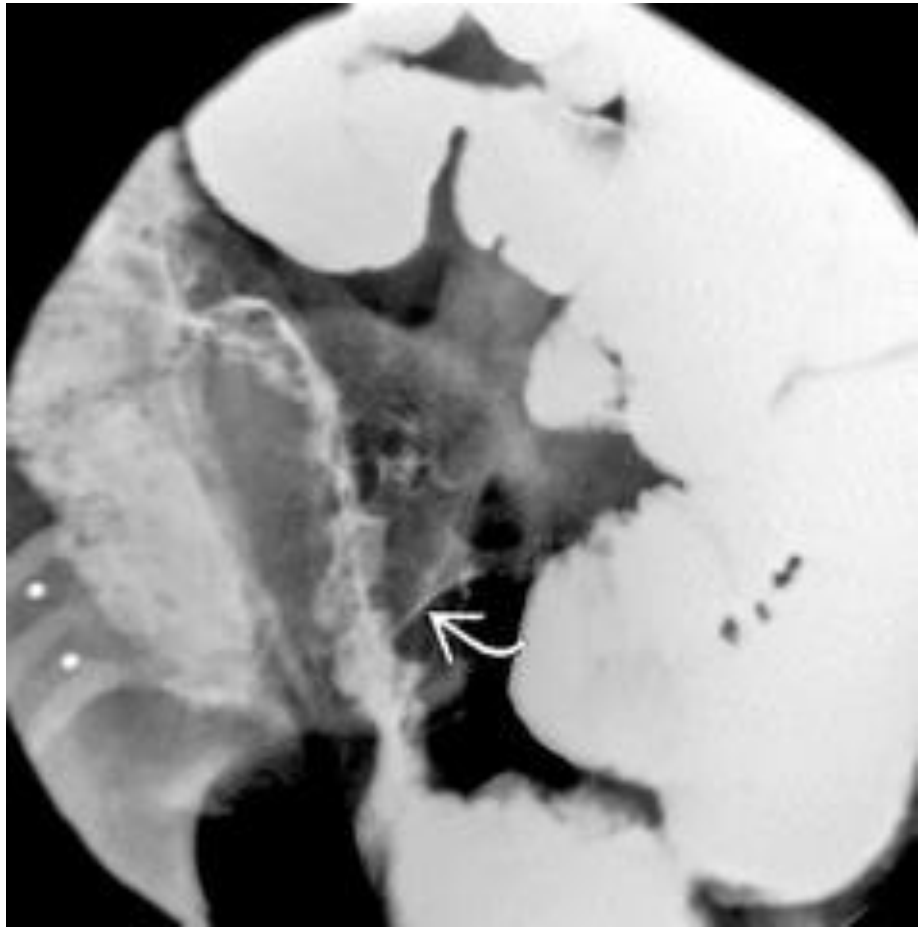
mesenteric / intra-abdominal abscess or phlegmon formation 8

abscesses are eventually seen in 15 - 20% of patients 8

CT is also able to give valuable information on:

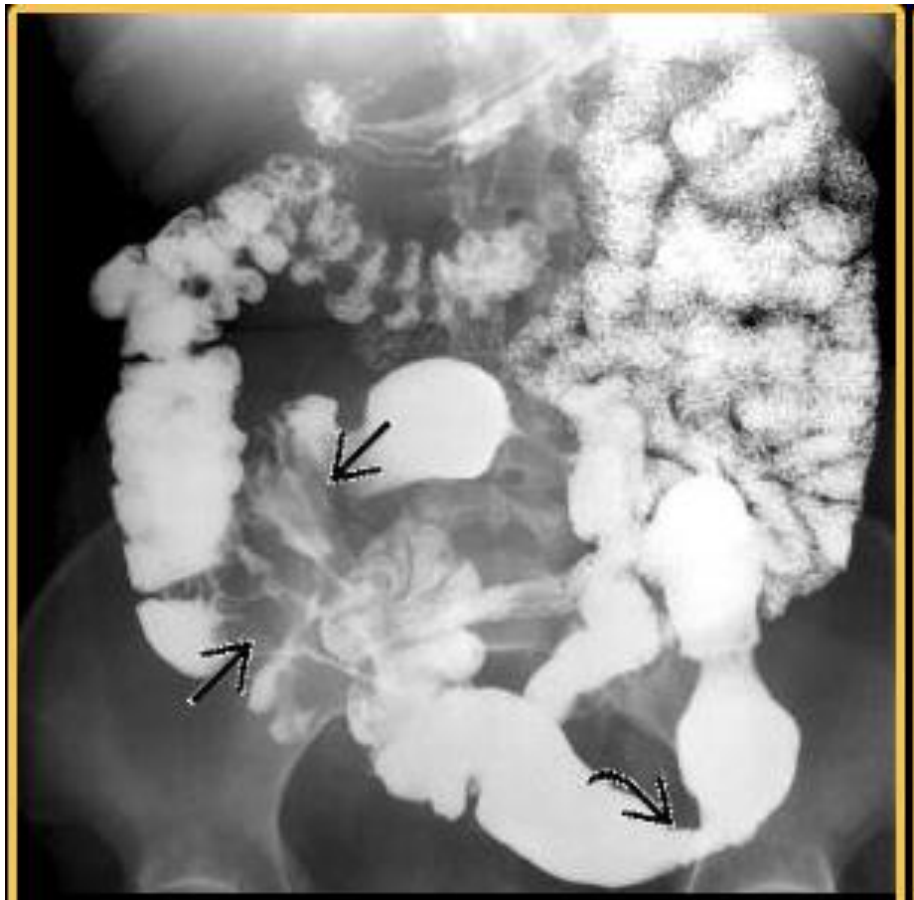
perianal disease

hepatobiliary disease



Small bowel follow through shows longitudinal and transverse ulcerations of the ileal mucosa ("cobblestoning") and luminal narrowing. The opacified sinus tract (white curved) is also seen.

Crohn Disease

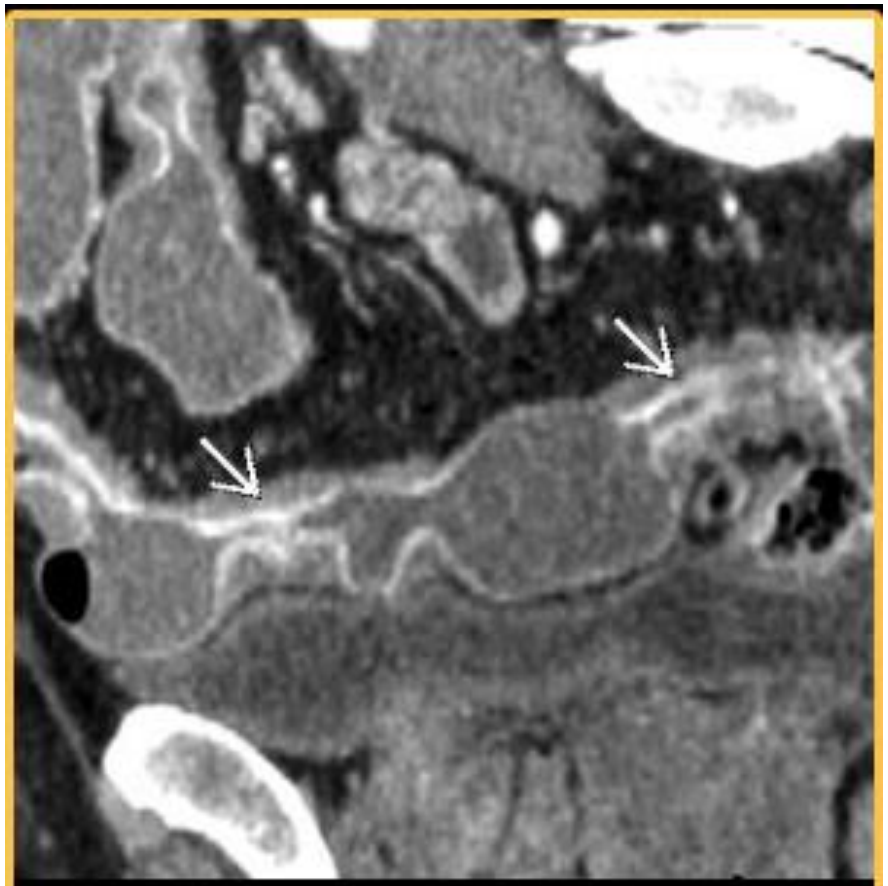


SBFT in a 26-year-old woman presenting with RLQ pain and fever demonstrates severe small bowel strictures, fistulas (black arrow), and ulceration with skip areas (black curved).

Small bowel follow through shows chronic Crohn disease. Note the mucosal "cobblestoning" (white arrow) and wide separation of the loops from creeping fat (white open).

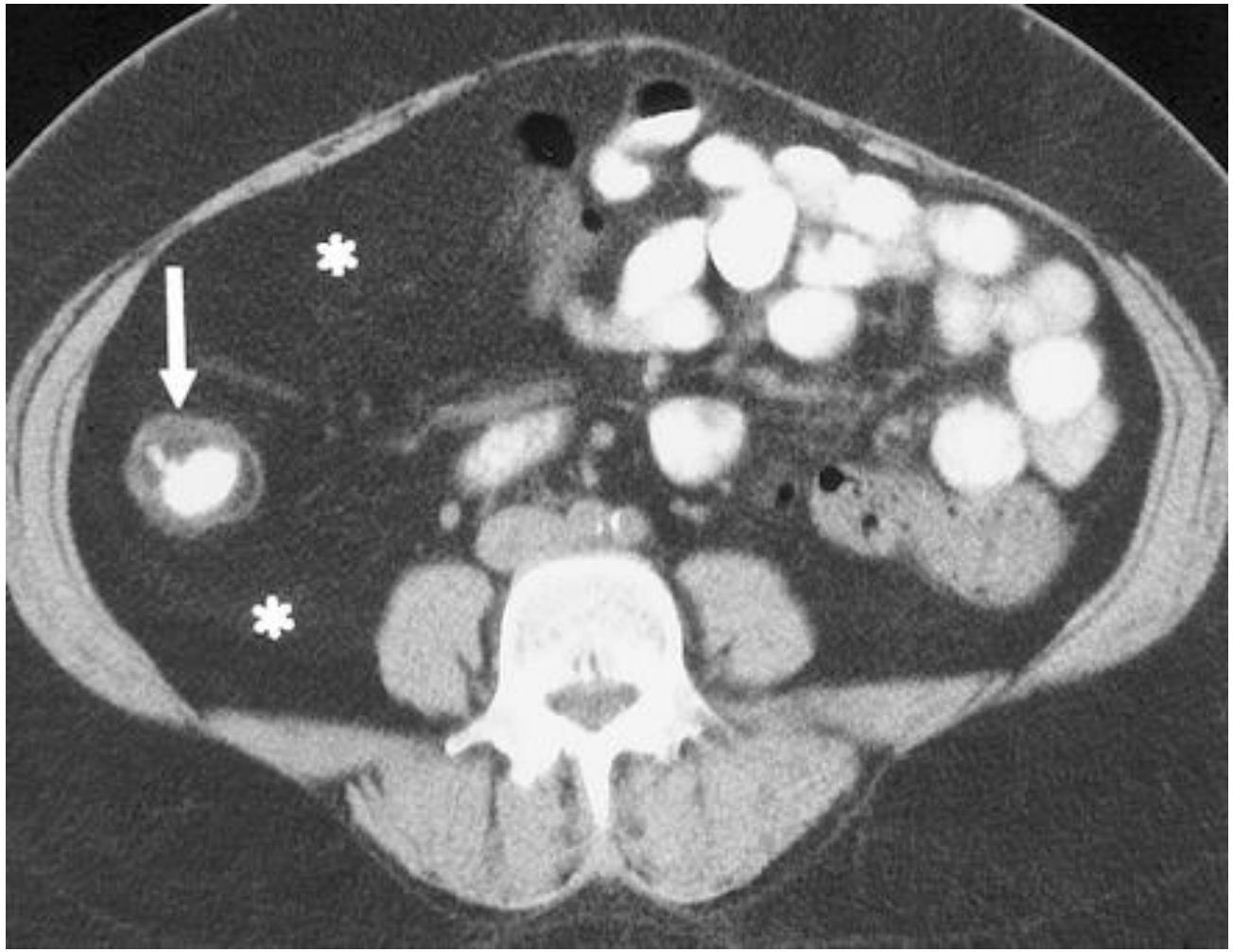
Crohn Disease

SBFT shows a "cobblestone" appearance of a terminal ileum, due to longitudinal, transverse ulcerations (white arrow).



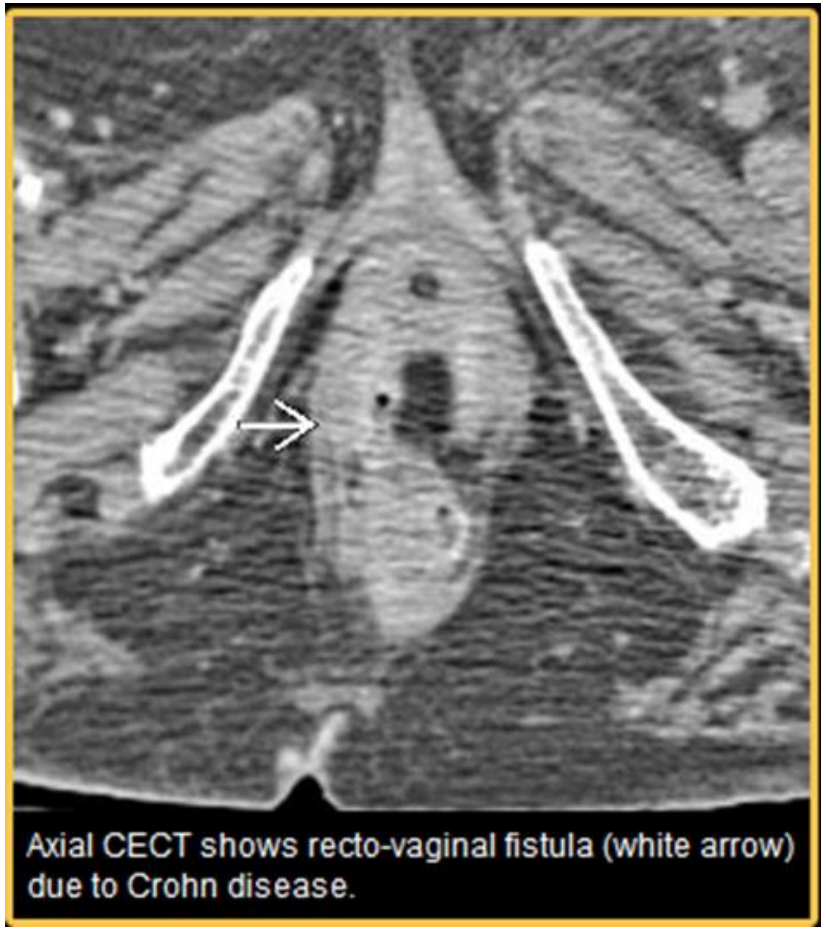
Coronal CT enterography curved planar reconstruction through the diseased segment of the terminal ileum in the same patient reveals skip areas of involvement with 2 areas of stricture formation (white arrow).

Crohn disease. CT scan obtained with oral contrast material shows low-attenuation submucosal fat in the ascending colon (arrow) and fibrofatty proliferation of adjacent mesenteric fat (*).

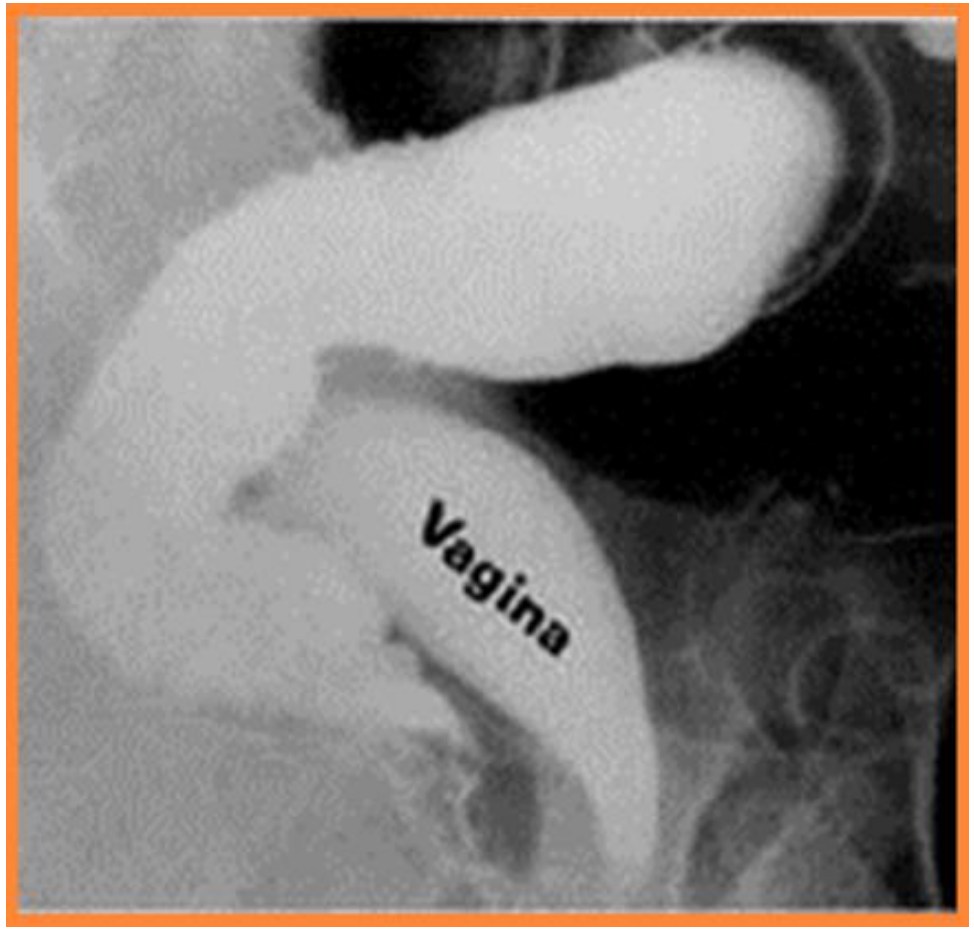


Crohn Disease

RECTOVAGINAL FISTULA



Axial CECT shows recto-vaginal fistula (white arrow) due to Crohn disease.



Ulcerative Colitis

Ulcerative colitis (UC) is an inflammatory bowel disease which predominantly **affects the colon**, but also has extraintestinal manifestations.

Epidemiology

Typically ulcerative colitis manifests in ***young*** adults (15 - 40 years of age) and is more prevalent in ***males***. A combination of environmental and genetic factors are thought to play a role in the pathogenesis, although the condition remains idiopathic.

Clinical presentation

Clinically patients **have chronic diarrhoea associated with tenesmus, pain and fever**

Pathology
Unlike Crohn's disease which is characteristically a **transmural disease**, ulcerative colitis is usually ***limited to the mucosa*** 1. Chronic disease is associated with a significantly **elevated malignancy risk**, of up to 0.5 - 1.0% per year after 10 years of disease.

The diagnosis is often made with endoscopy, which also allows biopsy of any suspicious areas.

Associations
primary sclerosing cholangitis (PSC)
moya moya phenomenon
ankylosing spondylitis

Radiographic features

Involvement of the rectum is almost always present (95%) 1, with the disease involving variable amounts of the more proximal colon, in continuity.

The **entire colon** may be involved, in which case oedema of the terminal ileum may also be present (so-called **back-wash ileitis**).

In very severe cases, the colon becomes atonic, with marked dilatation, worsened by bacterial overgrowth. This leads to **toxic megacolon** which although uncommon has a poor prognosis.

Plain film

Mural thickening is common, **with thumbprinting** also seen in more severe cases.

Barium enema

Mucosal inflammation lends a granular appearance to the surface of the bowel. As inflammation increases, the bowel wall and haustra thicken.

Mucosal ulcers are undermined (button-shaped ulcers). When most of the mucosa has been lost, islands of mucosa remain giving it a pseudo-polyp appearance.

In chronic cases the bowel becomes featureless with loss of normal haustral markings, luminal narrowing and bowel shortening (lead pipe sign).

Colorectal carcinoma in the setting of ulcerative colitis is more frequently sessile and may appear to be a simple stricture.

CT

CT will reflect the same changes that are seen with a barium enema, with the additional advantage of being able to directly visualise the colonic wall, the terminal ileum and identify extra-colonic complications, such as perforations or abscess formation. It is important to note however that CT is insensitive to early mucosal disease.

In chronic cases, submucosal fat deposition is seen particularly in the rectum (fat halo sign). Also in this region, extramural deposition of fat, leads to thickening of the perirectal fat, and widening of the presacral space 1,2.

Colorectal carcinoma is often sessile. Focal loss of mural stratification or excessive mural thickness (> 1.5 cm) should prompt endoscopic evaluation

Ulcerative Colitis

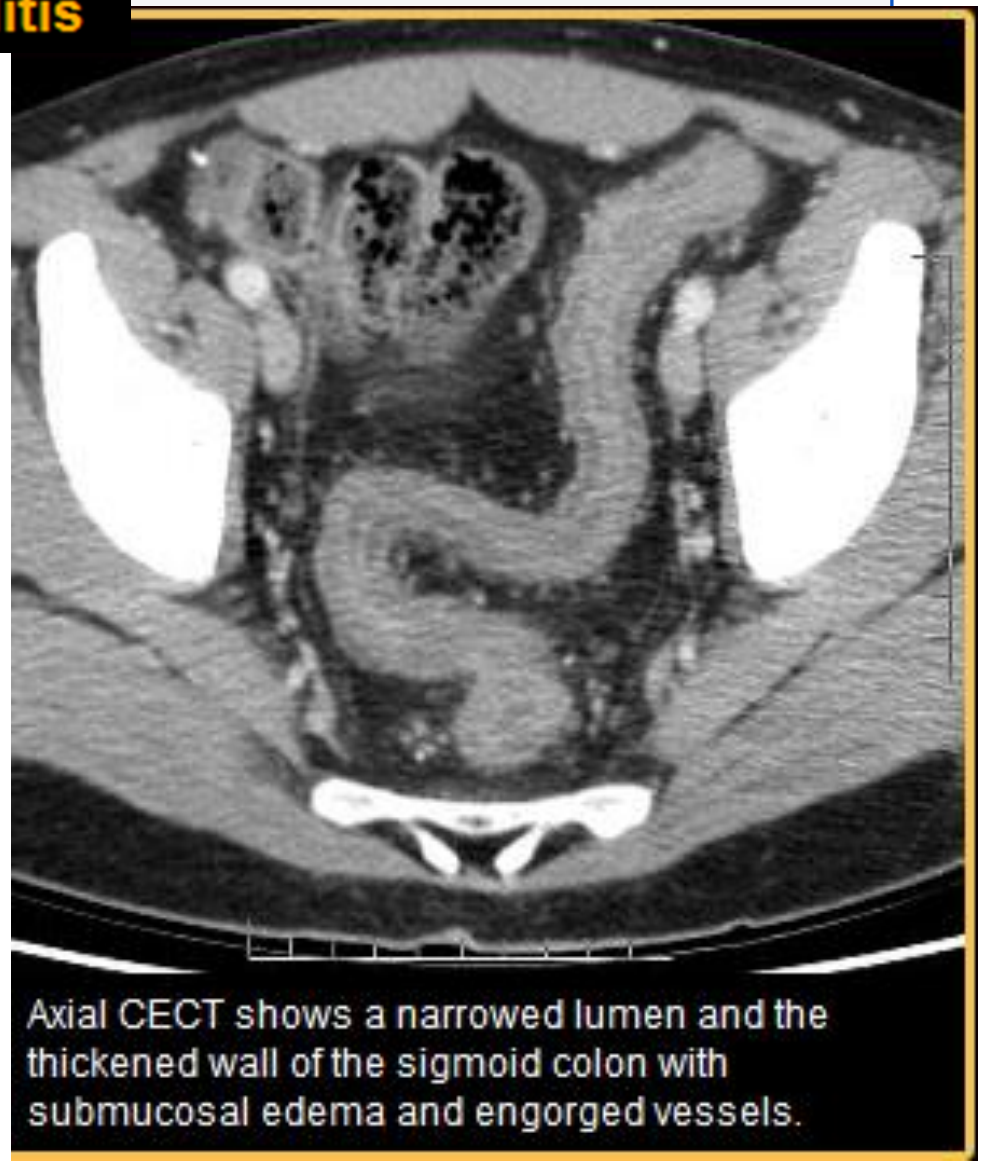
Graphic illustration demonstrates innumerable "collar button" ulcers and a loss of haustra throughout the descending and sigmoid colon.

Single-contrast barium enema (BE) shows innumerable "collar button" ulcers and loss of haustra throughout the descending colon.

Single-contrast BE shows an ahaustral colon due to chronic UC. Note the apple core stricture of the transverse colon (white arrow) due to adenocarcinoma.

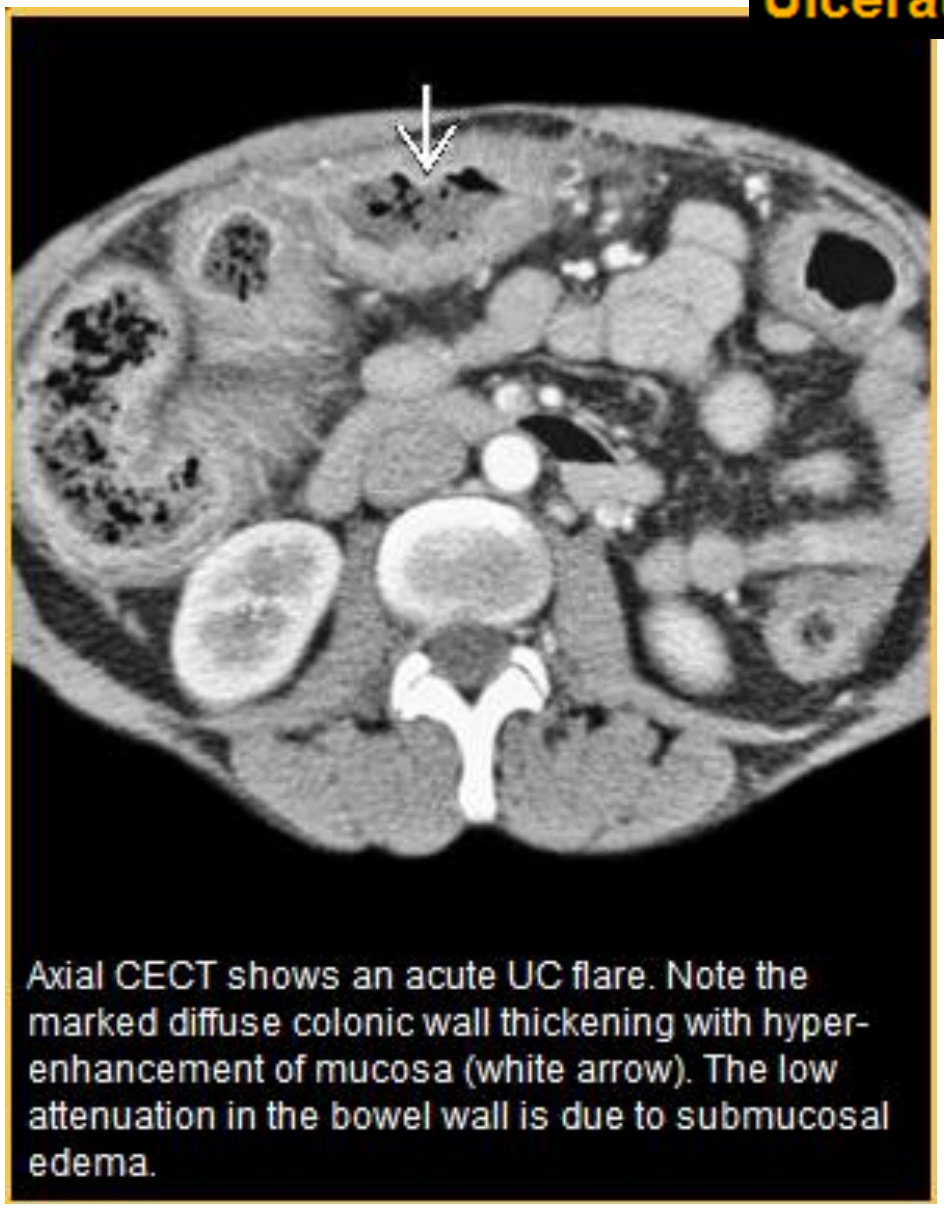
Ulcerative Colitis

Single-contrast barium enema (BE) shows prominent, thickened haustra in the right colon, but diminished haustra in the left colon.

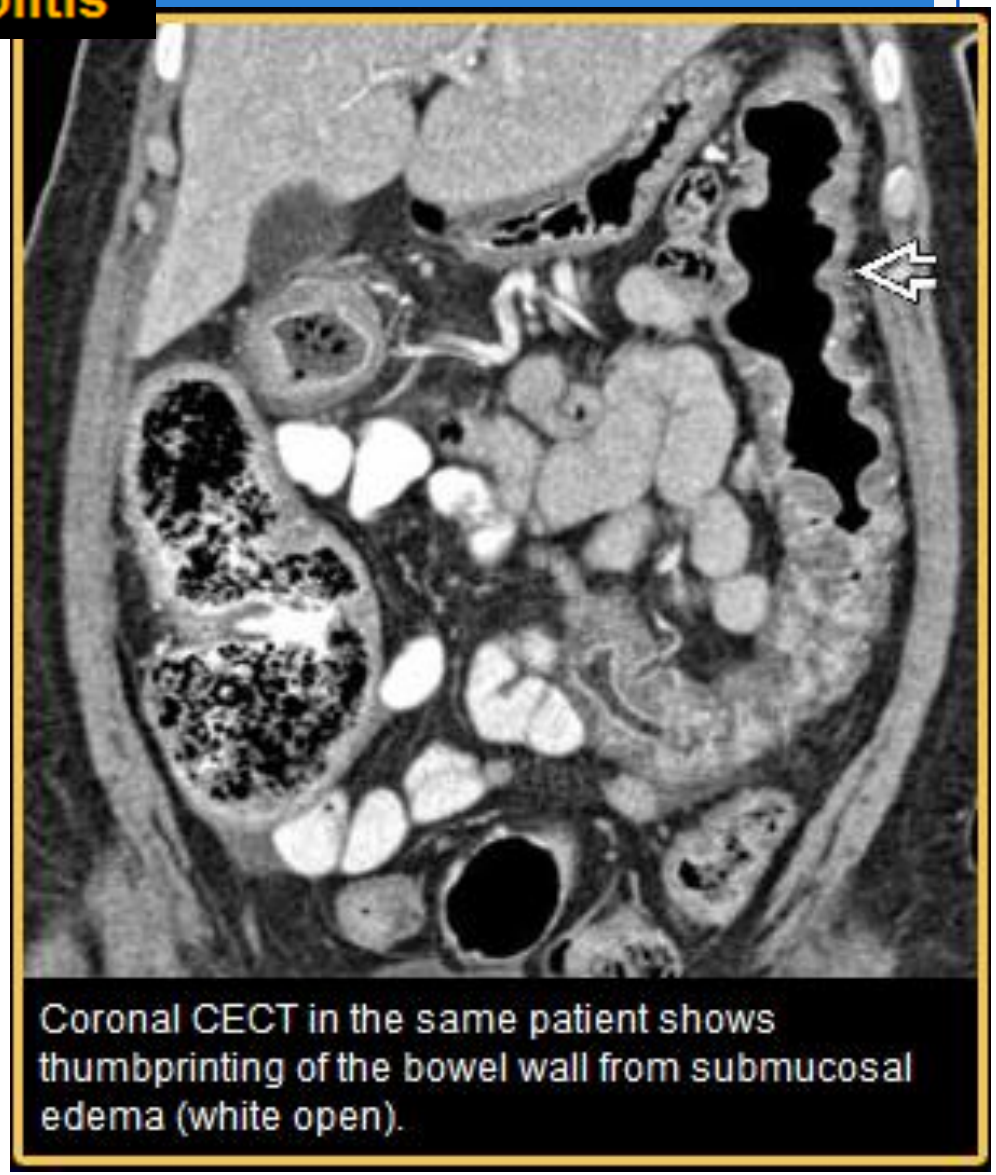


Axial CECT shows a narrowed lumen and the thickened wall of the sigmoid colon with submucosal edema and engorged vessels.

Ulcerative Colitis



Axial CECT shows an acute UC flare. Note the marked diffuse colonic wall thickening with hyper-enhancement of mucosa (white arrow). The low attenuation in the bowel wall is due to submucosal edema.



Coronal CECT in the same patient shows thumbprinting of the bowel wall from submucosal edema (white open).

Differences between crohn disease and ulcerative colitis

CROHN DISEASE

1)Rectum involved in half the cases

2)Colon may be affected segmently (skip lesion)

3)Ulcer deep

4)Some cases show asymmetrical loss of haustra

ULCERATIVE COLITIS

1)Rectum involved in all the cases

2)Colon always affected continously

3)Ulcer shallow

4)Symmetrical loss of haustra is the rule

Differences between crohn disease and ulcerative colitis

5)Fistulae are feature	5)Fistulae very rare
6)Anal or perianal lesions frequent	6)Anal or perianal lesions uncommon
7)Small bowel involvement common particularly terminal ileum with narrowing the ileo-ceacal valve.	7)Small bowel normal -dilatation of the terminal ileum may be seen.

Diverticular disease

Definitions

Asymptomatic **outpouching** of colonic mucosa and submucosa, most commonly in **sigmoid colon**

General Features

Best diagnostic clue: Rounded or oval colon wall outpouchings

Location

Primarily sigmoid colon, but may occur in any segment except rectum

Size: 5-10 mm

Fluoroscopic Findings

Contrast enema

Better detected with air contrast than single contrast

Diverticulum with large neck; may resemble sessile polyp

Air-filled diverticula project out from bowel lumen

Appearance of diverticula varies depending on degree of air vs. barium in diverticulum

CT Findings

Outpouching filled with air, stool, or contrast agent

Normal pericolonic fat planes

No pericolonic fluid or fat stranding

Diverticulosis, Colonic

Graphic illustrates sigmoid diverticula, luminal narrowing, and wall thickening (circular muscle hypertrophy). There is a pericolic abscess due to th perforated diverticulum, but the rectum is spared.

Axial CECT in a 74-year-old asymptomatic man, scanned for routine surveillance of a known carcinoid tumor of the small bowel, demonstrates numerous air-filled diverticula involving the sigmoid colon (white arrow).

Sigmoid Volvulus

Definitions

Torsion or twisting of sigmoid colon around its mesenteric axis

General Features

Best diagnostic clue: Dilated sigmoid colon with inverted "U" configuration and absent haustra

Location: Midline; **directed toward RUQ or LUQ**; elevation of hemidiaphragm

Radiographic Findings

Radiography

Sigmoid volvulus

Diagnostic in 75% of cases

Closed loop obstruction: Segment of bowel obstructed at 2 points

Absent rectal gas in spite of prone or decubitus views

Inverted "U" shape with absent haustra

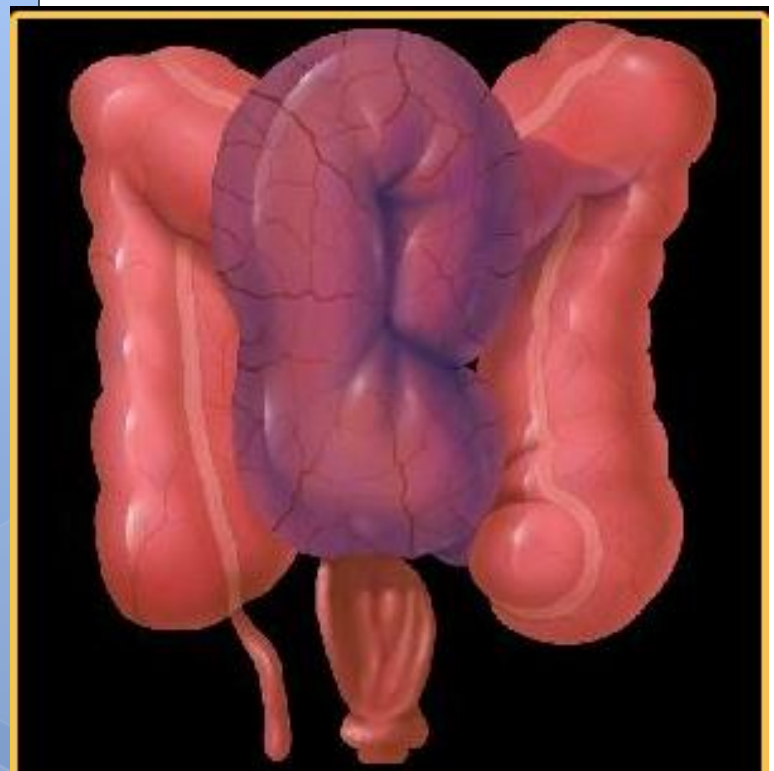
CT

"Beaking": Progressive tapering of afferent and efferent limbs leading into twist

"Whirl" sign: Tightly twisted mesentery and bowel

Compound volvulus: Medial deviation of distal left colon with pointed appearance of medial border

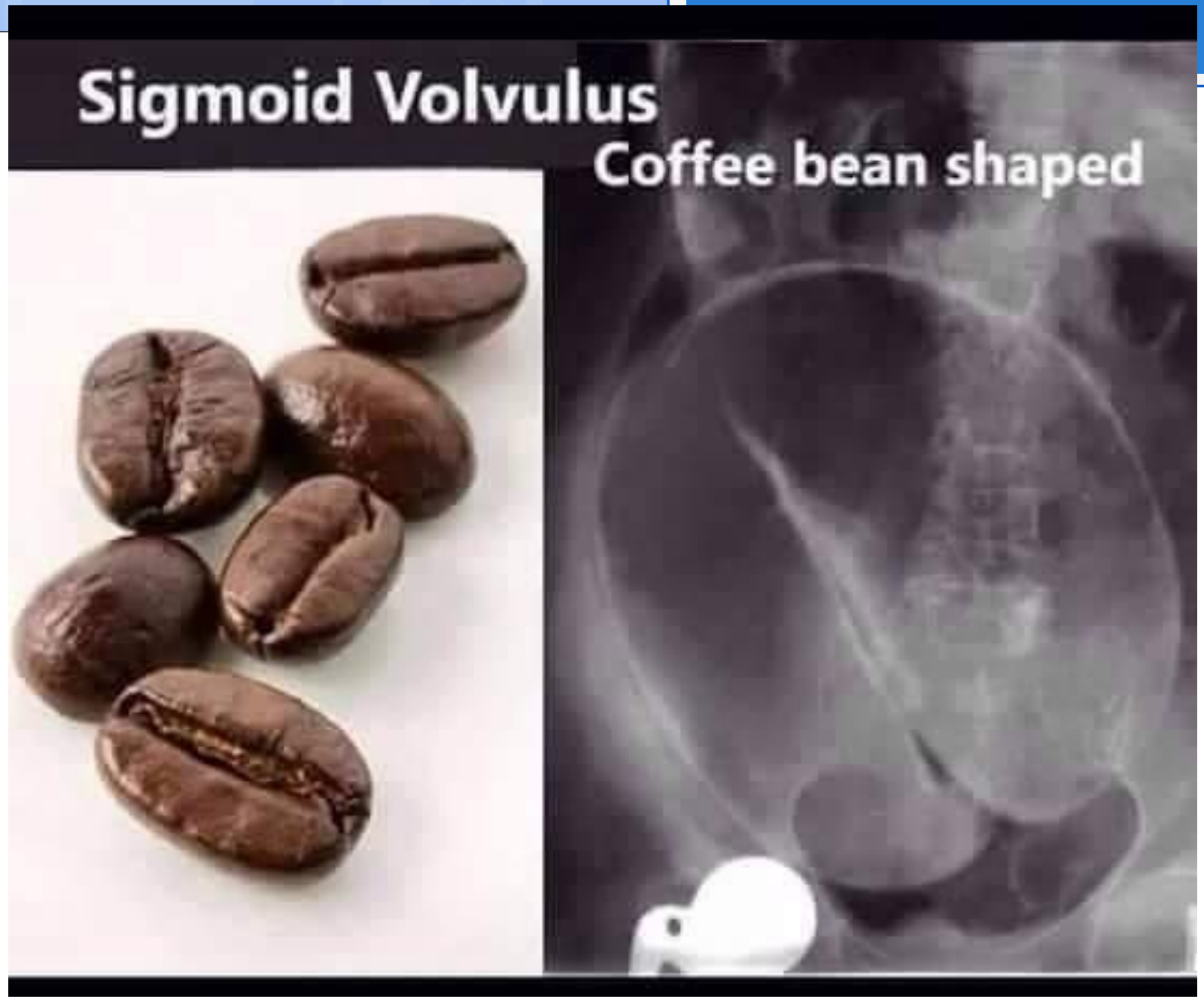
Sigmoid Volvulus



Graphic shows a dilated, twisted, elongated sigmoid colon with venous engorgement and colonic obstruction.

Frontal radiograph in a 75-year-old man presenting with abdominal pain and constipation demonstrates a classic inverted U-shaped, massively dilated sigmoid colon directed towards the right hemidiaphragm (white arrow).

Coronal CECT in the same patient illustrates a swirled appearance to the mesenteric pedicle at the site of the sigmoid volvulus (white open), characteristic findings in this setting.


Sigmoid Volvulus
Coffee bean shaped

Cecal Volvulus

Definitions

Rotational twist of right colon on its axis

General Features

Best diagnostic clue: Dilated, twisted cecum with **tip pointing to LUQ**

Imaging Recommendations

Best imaging tool: Contrast enema or CT

Radiographic Findings

Radiography

Dilated, air-filled cecum in LUQ

Single, long air-fluid level

Medially placed ileocecal valve → soft tissue indentation → gas-filled cecum with kidney or **coffee bean shape**

Markedly distended gas or fluid-filled small bowel, little gas in distal colon

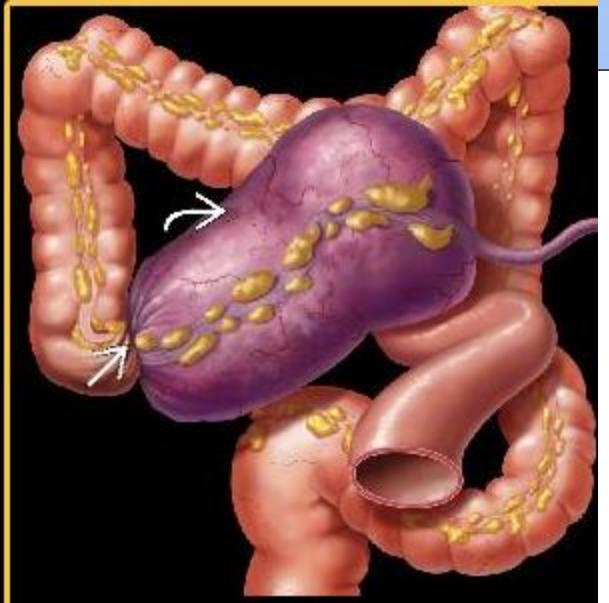
CT Findings

CECT

"Beaking": Progressive tapering of afferent and efferent limbs leading into twist

"**Whirl" sign**: Tightly twisted mesenteric vessels

Cecal Volvulus



Graphic shows a twist (volvulus) (white arrow) of the ascending colon, obstructing the lumen and blood supply. The cecum (white curved) on the mesentery is dilated and displaced toward the LUQ.

Supine radiograph shows a dilated cecum in the mid-abdomen pointed toward the left upper quadrant.

Axial CECT in the same patient shows the dilated small bowel extending down to the cecum (white open) in the left mid-abdomen. Note the compressed, stool-filled sigmoid colon (white arrow) deviated by the dilated cecum. The fact that the cecum is not visualized in the RLQ is a clue that this dilated structure represents a twisted cecum.


Whirlpool sign
midgut volvulus

Colon Carcinoma

Malignant transformation of colonic mucosa

Imaging

Location: Cecum (10%), ascending colon (15%), transverse colon (15%), descending colon (5%), sigmoid colon (25%), rectosigmoid colon (10%), rectum (20%)

Radiology is critical for screening, diagnosis, treatment, and follow-up of colorectal carcinoma

Detection: Double contrast barium enema

Early cancer: Sessile (plaque-like) lesion or thick, short polyp

Advanced cancer: Large polyp, "saddle" or "***apple core" lesion***

Staging: Helical CT

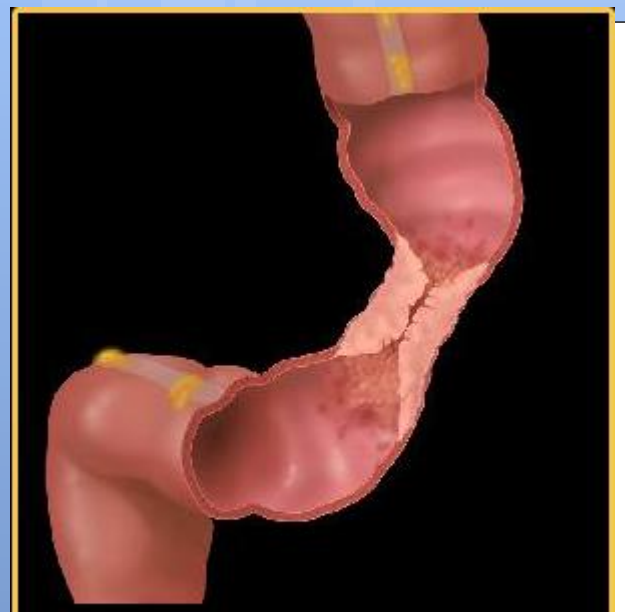
Asymmetric mural thickening ± irregular surface

Pericolonic fat infiltration; spread to adjacent organ

Metastases to mesenteric nodes, peritoneum, liver

Tumor recurrence and surveillance: PET CT

Colon Carcinoma



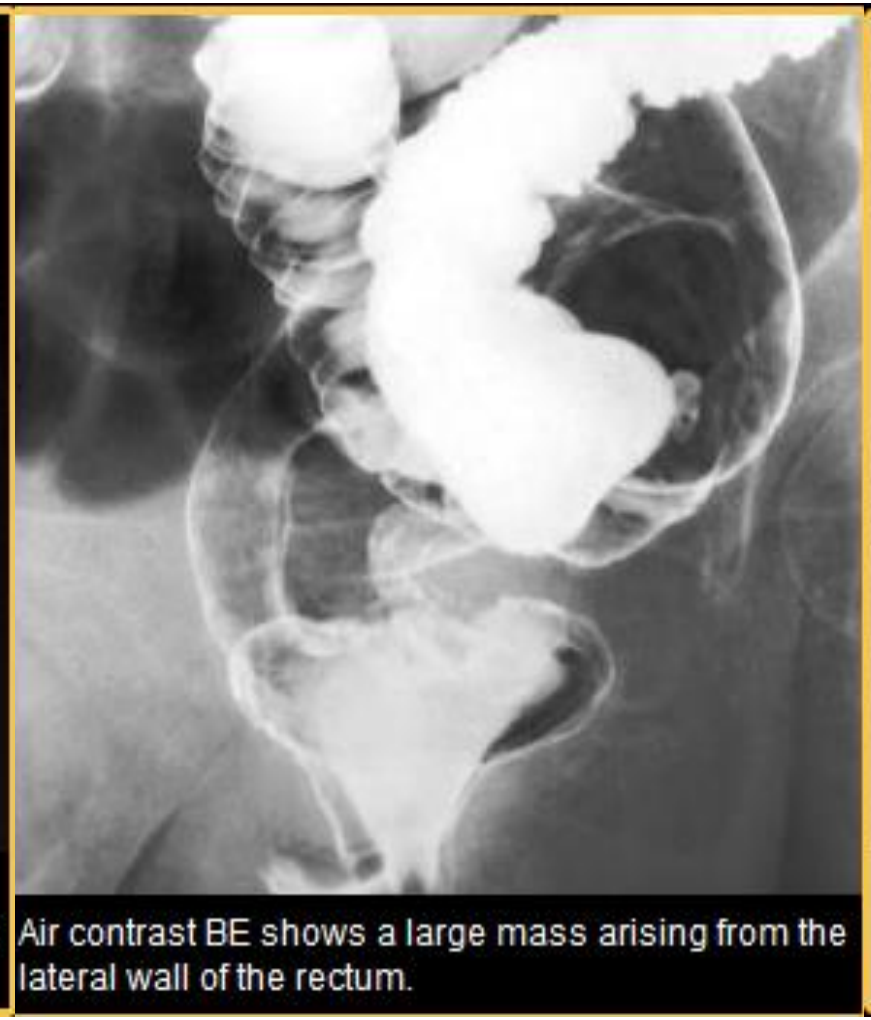
Graphic shows an "apple core" constricting tumor of the sigmoid colon with circumferential narrowing of the lumen and a nodular tumor surface, the typical appearance of a left-sided cancer. These patients often complain of constipation and rectal bleeding.

Single contrast barium enema shows a classic "apple core" lesion of the sigmoid colon. Note the short segment, irregular, circumferential narrowing of the lumen with destroyed mucosa and nodular "shoulders."

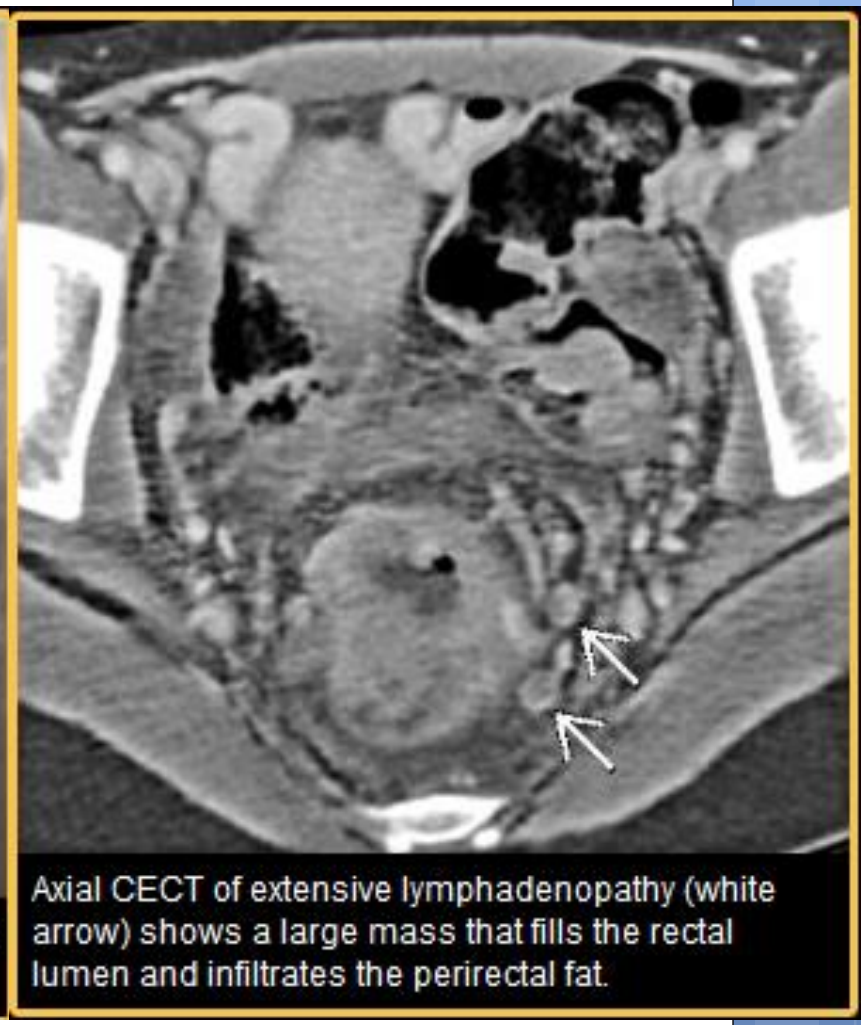
Axial CECT shows a large eccentric mass (white arrow) in the ascending colon with extensive infiltration of pericolonic fat and lymphadenopathy (white open).

Rectal Carcinoma

Single contrast BE shows a mass (black arrow) arising from the anterior rectal wall as a filling defect in the barium pool.



Air contrast BE shows a large mass arising from the lateral wall of the rectum.



Axial CECT of extensive lymphadenopathy (white arrow) shows a large mass that fills the rectal lumen and infiltrates the perirectal fat.

Intussusception

- Definitions
- Invagination or **telescoping of proximal segment of bowel (intussusceptum) into lumen of distal segment (intussuscipiens)**
- General Features
- Best diagnostic clue: **Bowel-within-bowel,** "coiled spring" appearance
- Location
- **Ileoileal > ileocolic > colocolic**
- **Usually small bowel (SB) in adults, ileocolic in children***

- **Radiographic Findings**
- Radiography: Air-fluid levels, proximal bowel dilatation, absence of gas in distal collapsed bowel
- Fluoroscopic Findings
- Fluoroscopic guided barium study
  - Retrograde barium study: Convex intracolic mass with **"claw" sign**
    - Due to trapping of contrast between folds of intussusceptum & intussuscipiens

Ultrasonographic Findings

Grayscale ultrasound

Transverse US: **"Target," "doughnut**," or "bull's-eye" sign

- Peripheral hypoechoic halo: Edematous wall of intussuscipiens
- Intermediate hyperechoic area: Space between intussuscipiens and intussusceptum
- Internal hypoechoic ring

Longitudinal US: "Pseudokidney" sign

- Multiple, thin, parallel, hypoechoic and echogenic stripes

Color Doppler: Mesenteric vessels dragged between entering and returning wall of intussusceptum

CT Findings

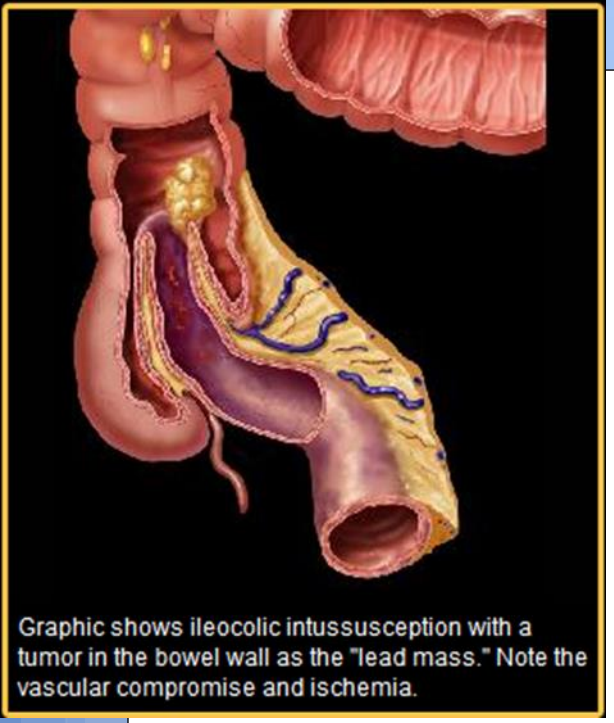
"Target" sign: Earliest stage

- Outer layer represents intussuscipiens, inner layer represents intussusceptum

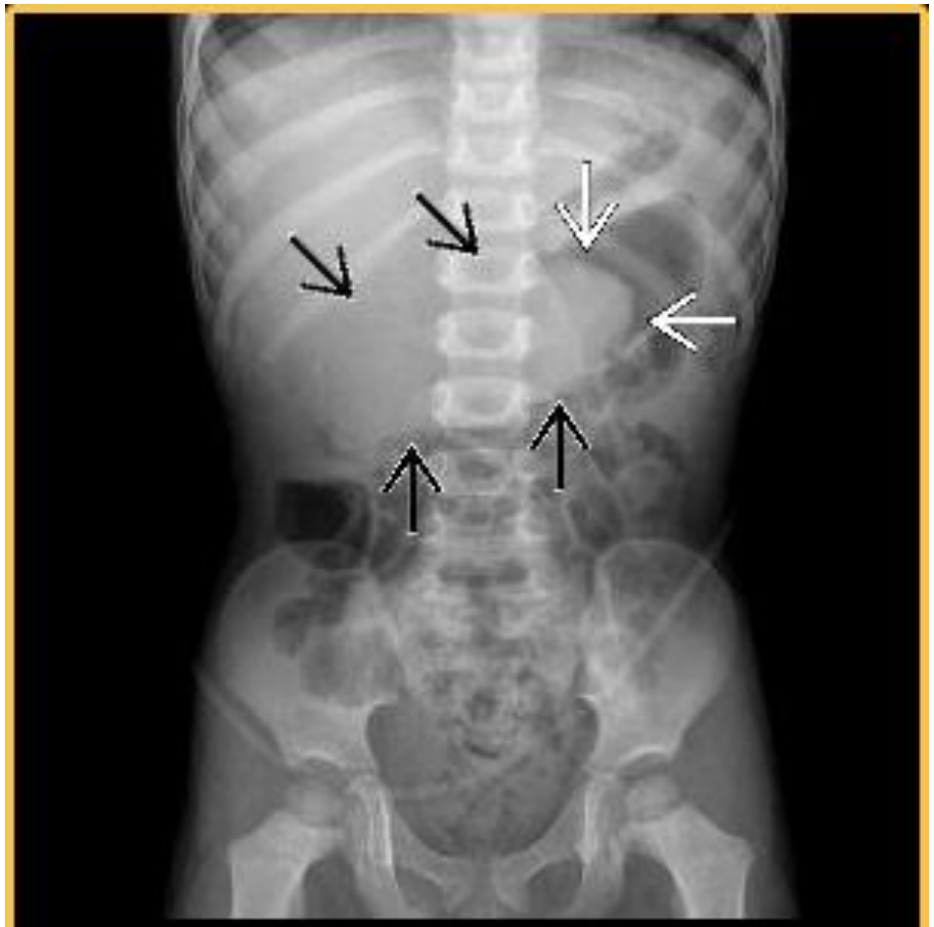
Sausage-shaped mass: Layering pattern (later phase)

- Alternating layers of low-attenuation mesenteric fat, high-attenuation bowel wall
- Enhancing mesenteric vessels

Intussusception



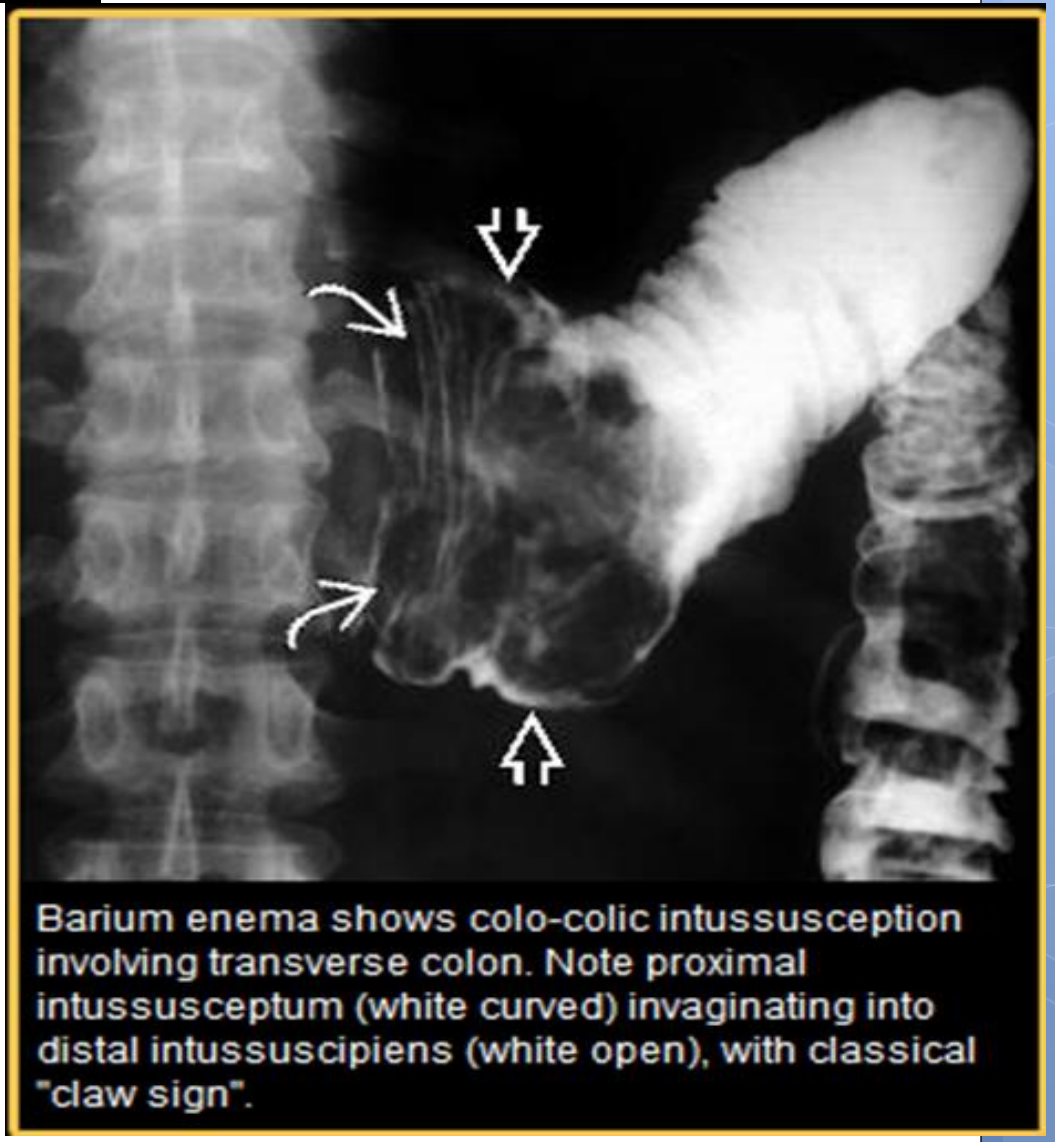
Graphic shows ileocolic intussusception with a tumor in the bowel wall as the "lead mass." Note the vascular compromise and ischemia.



Radiograph shows a soft tissue prominence over ascending and transverse colon (black arrows) with visible large soft tissue mass (white arrows) surrounded by meniscus of gas.

Air enema (initial image) shows air-filled descending colon with large soft tissue mass (arrows) confirming intussusception in transverse colon.

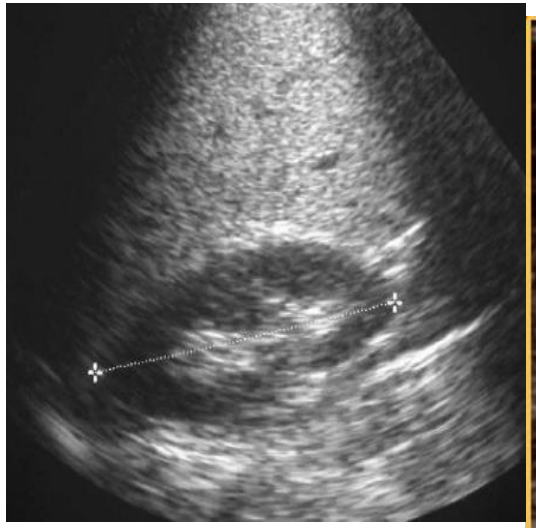
Intussusception

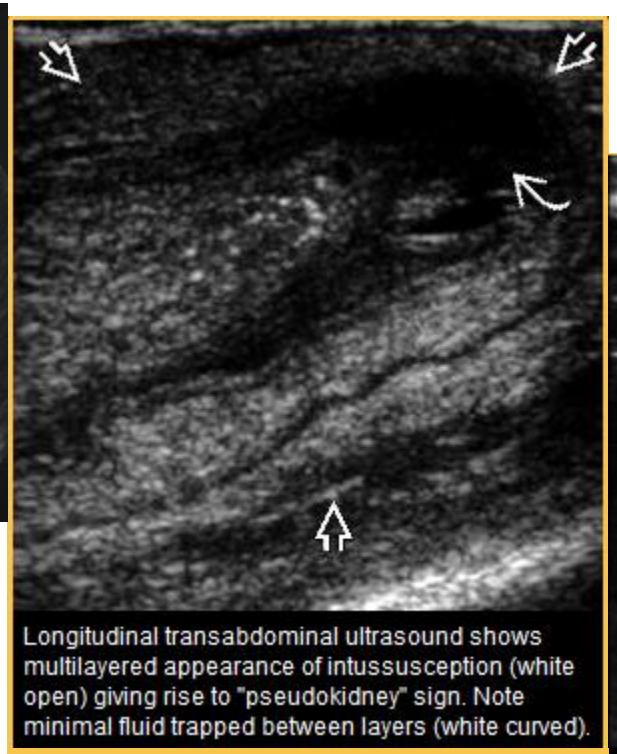


Barium enema shows colo-colic intussusception involving transverse colon. Note proximal intussusceptum (white curved) invaginating into distal intussuscipiens (white open), with classical "claw sign".

Intussusception

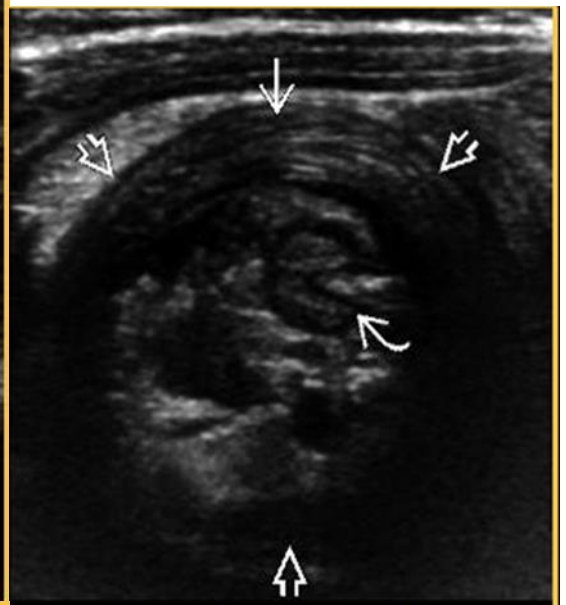
Renal Ultrasound





Longitudinal transabdominal ultrasound shows multilayered appearance of intussusception (white open) giving rise to "pseudokidney" sign. Note minimal fluid trapped between layers (white curved).

Typical, US, Pseudokidney appearance



Transverse transabdominal ultrasound shows classical "target" or "doughnut" sign of intestinal intussusception (white open). Note ring in ring appearance formed by different layers (white arrow) of intestine & central lymph node (white curved) acting as lead point.

Typical, US, Target sign

Colonic Polyps

Definitions

Protruding, space-occupying lesion within colonic lumen.

General Features

Best diagnostic clue: Smooth-surfaced intraluminal small mass on CT colonoscopy or barium enema

Location: Sigmoid (41%)*, Cecum (4%), ascending colon (6%), hepatic flexure (4%), transverse (2%), splenic flexure (8%), descending (20%),, rectum (23%)

Morphology

Sessile polyps: Broad base with little or no stalk

Pedunculated polyps: Arise from narrow stalk

Other general features

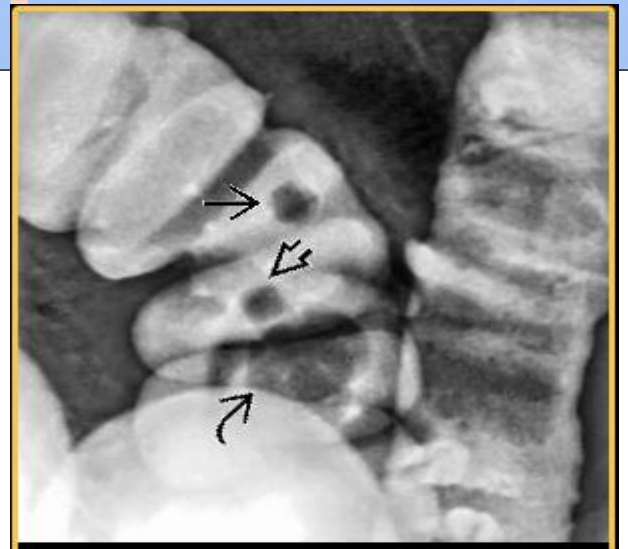
2 types of colon polyps

Neoplastic: Adenomatous (tubular, tubulovillous, and villous)

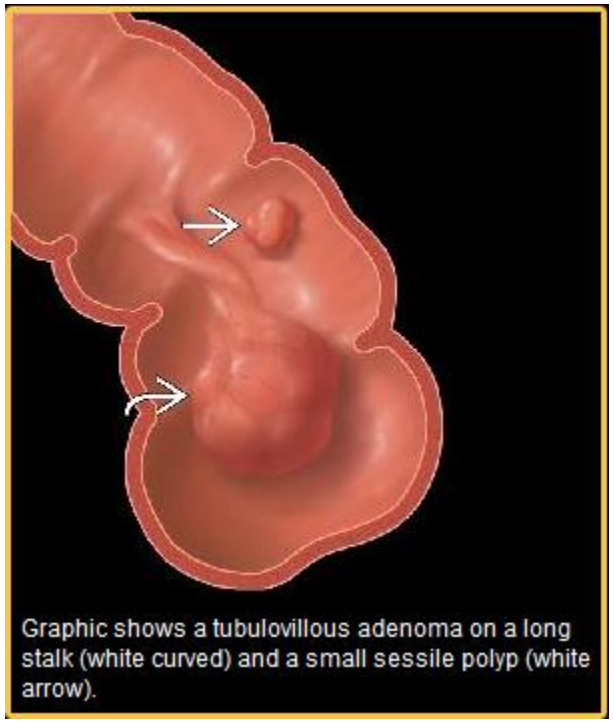
Nonneoplastic: Hyperplastic, hamartomatous, and inflammatory

Best imaging tool: CT colonography (CTC) or air-contrast barium enema

Colonic Polyps

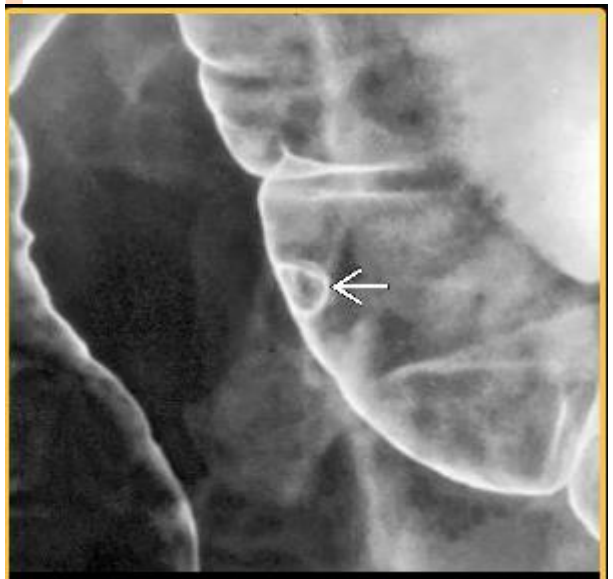


Single contrast barium enema shows a tubulovillous adenoma with a large head (black curved) and a long stalk (black open). A small sessile polyp (black arrow) is also seen.

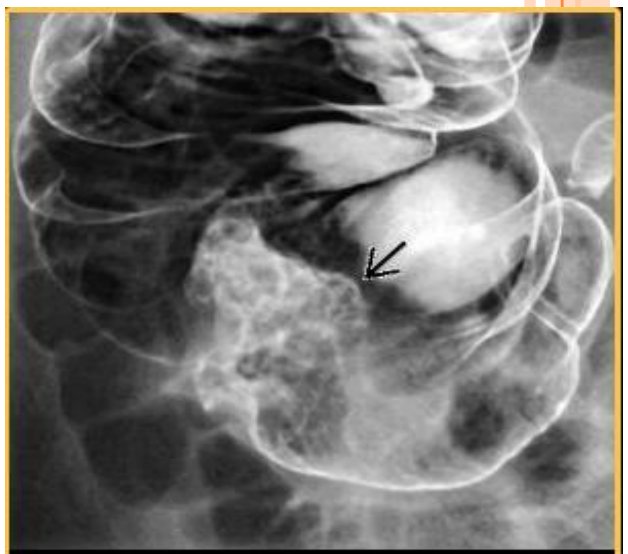


Graphic shows a tubulovillous adenoma on a long stalk (white curved) and a small sessile polyp (white arrow).

Air contrast barium enema shows numerous diverticula (white arrow) and a large pedunculated polyp on a stalk (black arrow) in this patient with tubulovillous adenoma. In a patient with known diverticulosis, it is often much easier to perform and interpret a single contrast rather than an air (double) contrast barium enema.



Air contrast barium enema shows a small sessile tubular adenoma (white arrow). The dome of the "bowler hat" points toward the colonic lumen.



Air contrast barium enema shows a large sessile polyp (black arrow) in the cecum, having the typical appearance of a villous adenoma, with a cauliflower-like surface irregularity.

Acute Calculous Cholecystitis

Definitions

Acute inflammation of gallbladder (GB) secondary to calculus obstructing cystic duct

General Features

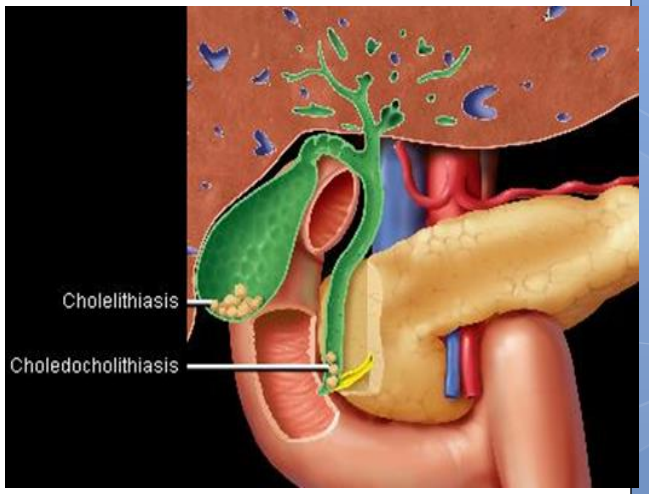
Best diagnostic clue

Impacted gallstone in cystic duct

Gallbladder wall thickening

Pericholecystic collection

Positive sonographic Murphy sign



Location: Stone impacted in GB neck or cystic duct

Size: Distended GB (> 5 cm transverse diameter)

Morphology: Distended GB more rounded in shape than normal "pear-shaped" configuration

Grayscale **ultrasound**

Uncomplicated cholecystitis

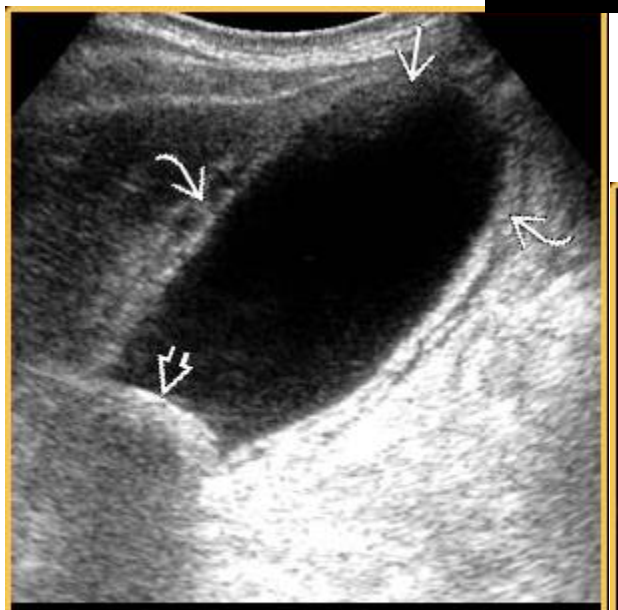
GB wall lucency "halo sign", sonolucent middle layer (edema)
Positive sonographic Murphy sign
Diffuse GB wall thickening (> 4 mm)
GB hydrops: Distension with AP diameter > 5 cm
Clear pericholecystic fluid

CT Findings

CECT

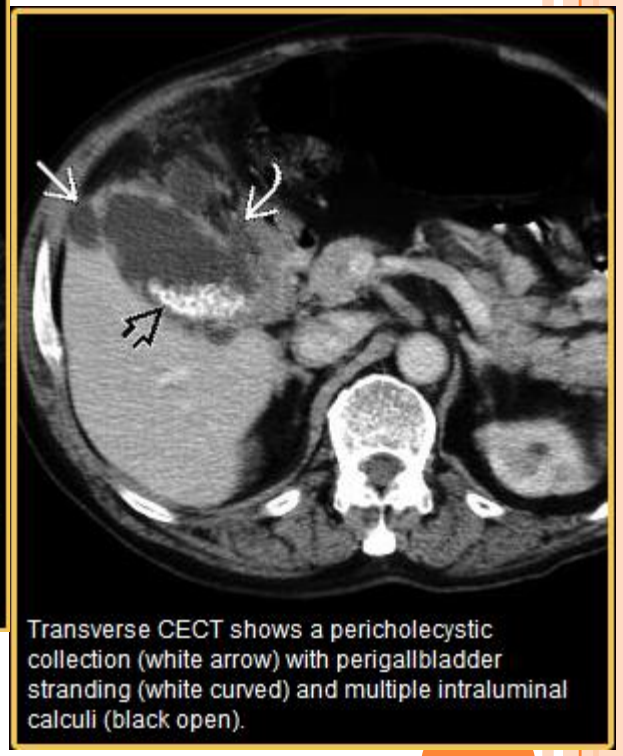
Uncomplicated cholecystitis
GB wall thickening
Increased mural enhancement
Pericholecystic fat stranding, pericholecystic fluid
Gallstones inside GB neck or cystic duct
Complicated cholecystitis
Intramural or pericholecystic abscesses leading to asymmetric GB wall thickening
Gas in lumen and/or wall of gallbladder
High attenuation gallbladder hemorrhage

Acute Calculous Cholecystitis



Oblique transabdominal ultrasound shows a distended gallbladder (white arrow), with an impacted gallstone (white open) at the gallbladder neck and diffuse wall thickening (white curved).

Longitudinal ultrasound in a 50-year-old woman with RUQ pain and focal tenderness reveals a large echogenic stone (white curved) with an acoustic shadow (white arrow) and a thickened gallbladder (calipers).



Transverse CECT shows a pericholecystic collection (white arrow) with perigallbladder stranding (white curved) and multiple intraluminal calculi (black open).

Acute Pancreatitis

Definitions

Acute inflammatory process of pancreas with variable involvement of other regional tissues or remote organ systems

General Features

Best diagnostic clue: Enlarged pancreas, fluid collections, obliteration of fat planes

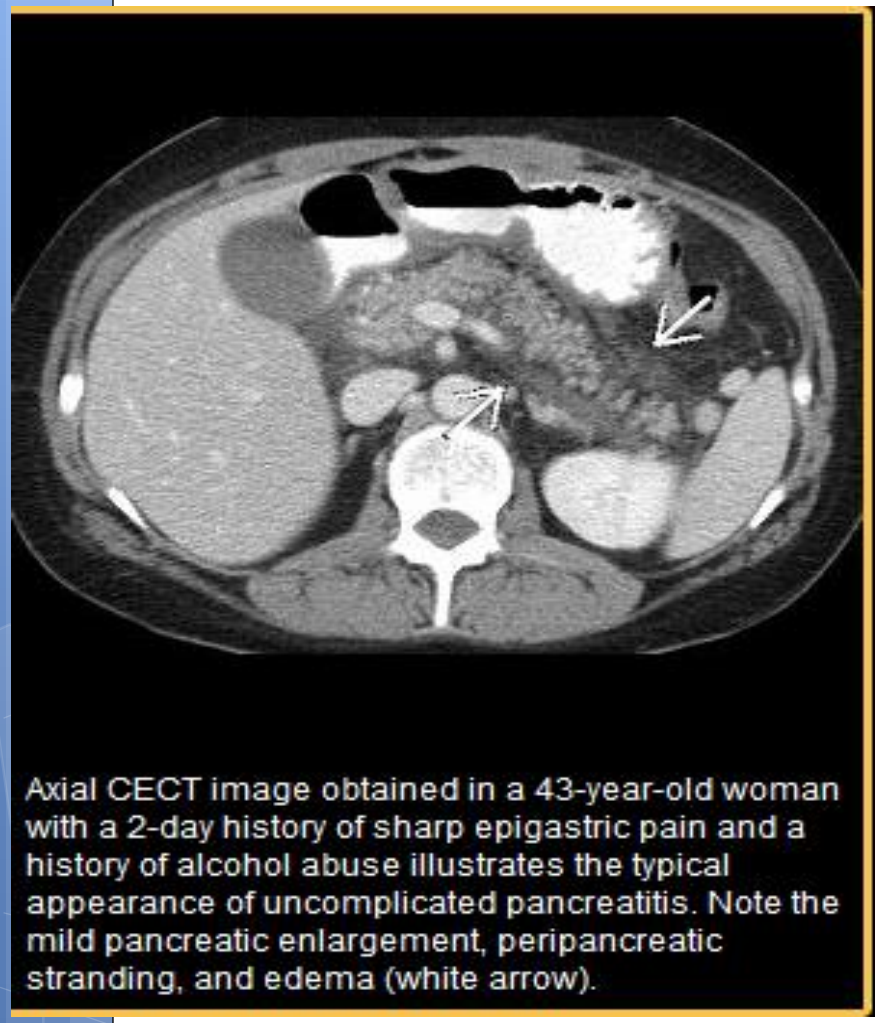
Location: Pancreatic and peripancreatic

Size: Pancreas increased in size (focal or diffuse)

Radiography
Duodenal ileus
Sentinel loop
Mildly dilated, gas-filled segment of small bowel ± air-fluid levels

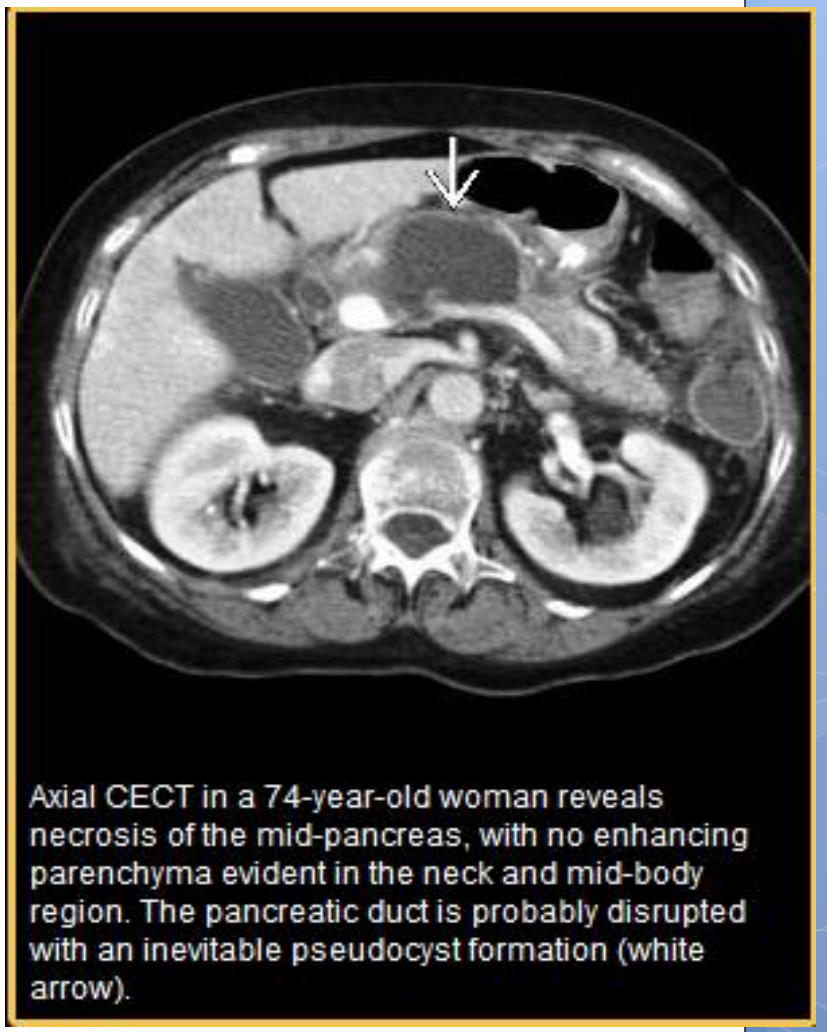
CT Findings
Focal or diffuse pancreatic enlargement
Heterogeneous enhancement with nonenhancing necrotic areas
Rim enhancement of acute fluid collections, abscesses, and pseudocysts
Infiltration of peripancreatic fat; gallstones
Pleural effusions, basilar atelectasis

Pancreatitis, Acute



Axial CECT image obtained in a 43-year-old woman with a 2-day history of sharp epigastric pain and a history of alcohol abuse illustrates the typical appearance of uncomplicated pancreatitis. Note the mild pancreatic enlargement, peripancreatic stranding, and edema (white arrow).

Axial CECT of necrotizing pancreatitis following ERCP shows extensive areas of nonenhancement, indicating necrosis (white arrow) of the body and tail of the pancreas.



Axial CECT in a 74-year-old woman reveals necrosis of the mid-pancreas, with no enhancing parenchyma evident in the neck and mid-body region. The pancreatic duct is probably disrupted with an inevitable pseudocyst formation (white arrow).

Edematus, swollen
Complication: psudocyst

Chronic Pancreatitis

Definitions

Irreversible inflammatory damage to pancreas, usually evident on imaging or functional testing

General Features

Best diagnostic clue: Atrophy of gland, dilated main pancreatic duct (MPD), intraductal calculi

Size: Pancreas usually decreased in size (atrophy)

Pancreatic calcification

Almost diagnostic of chronic pancreatitis

Radiographic Findings

Radiography

Plain abdomen radiograph

Pancreatic calcification

Small, irregular calcifications (local or diffuse)

CT Findings

CECT

Atrophy of body-tail parenchyma

Mass due to chronic pancreatitis: Varied enhancement due to presence or absence of fibrosis

Dilated MPD with ductal calculi

Intra- and peripancreatic pseudocysts

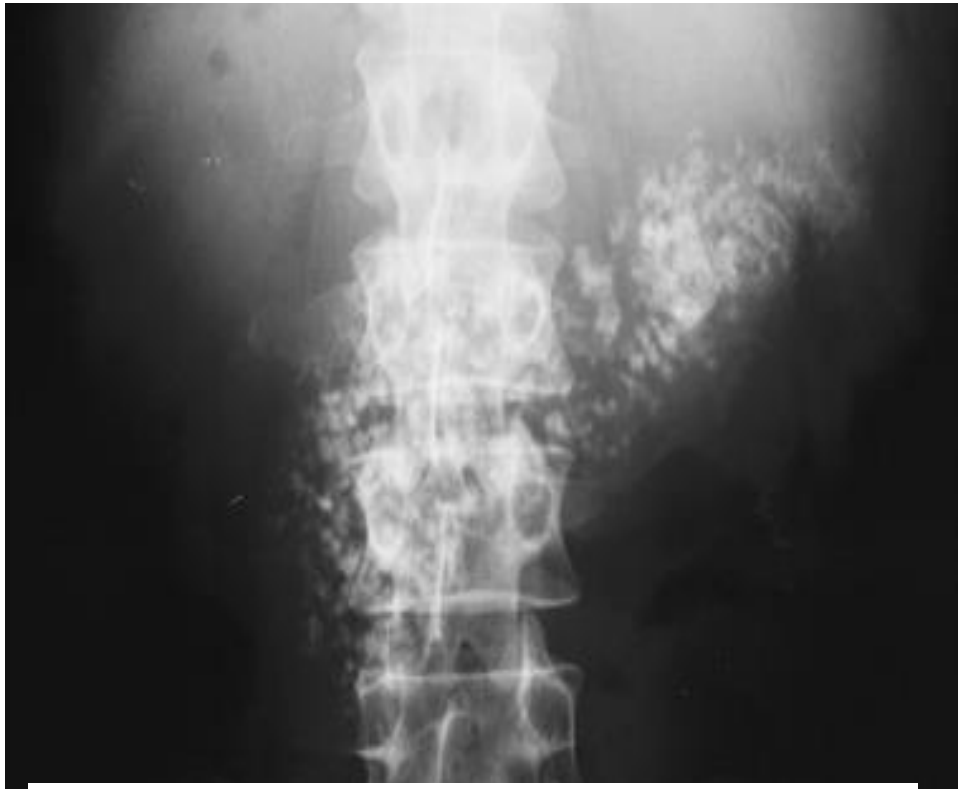
Thickening of peripancreatic fascia (with acute attack)

Splenic vein thrombosis, splenomegaly, varices

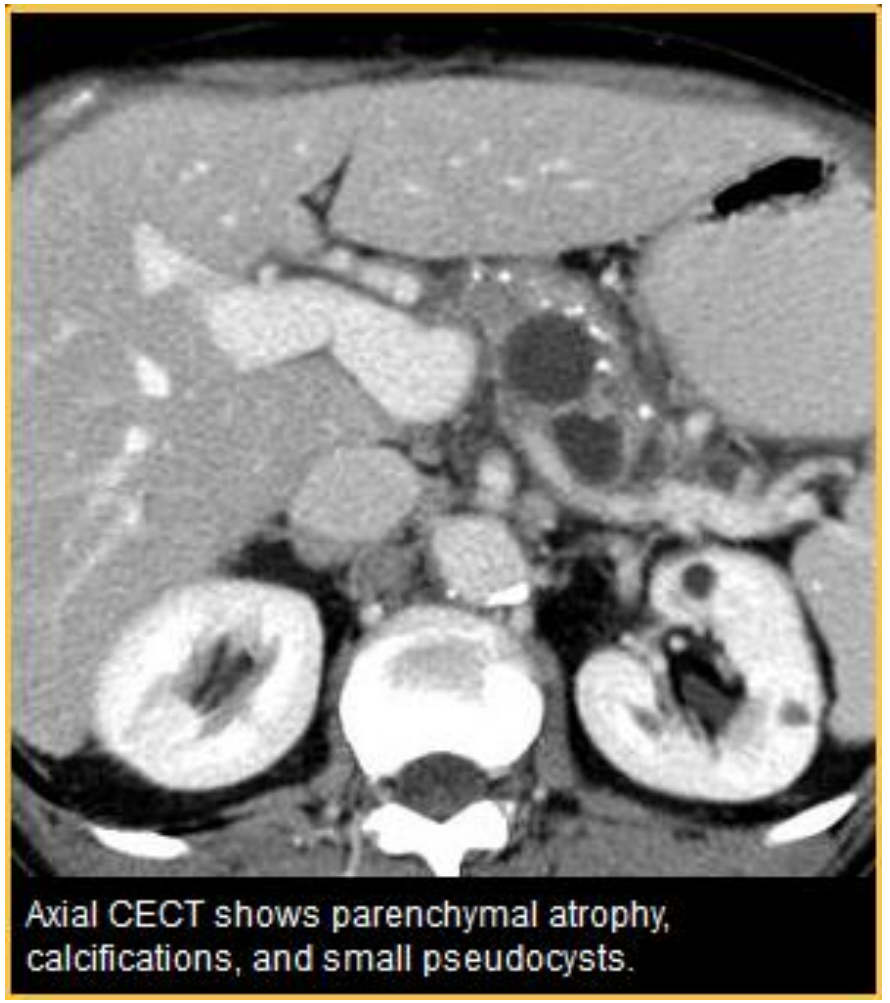
May progress to thrombosis of portal vein

Pancreatitis, Chronic

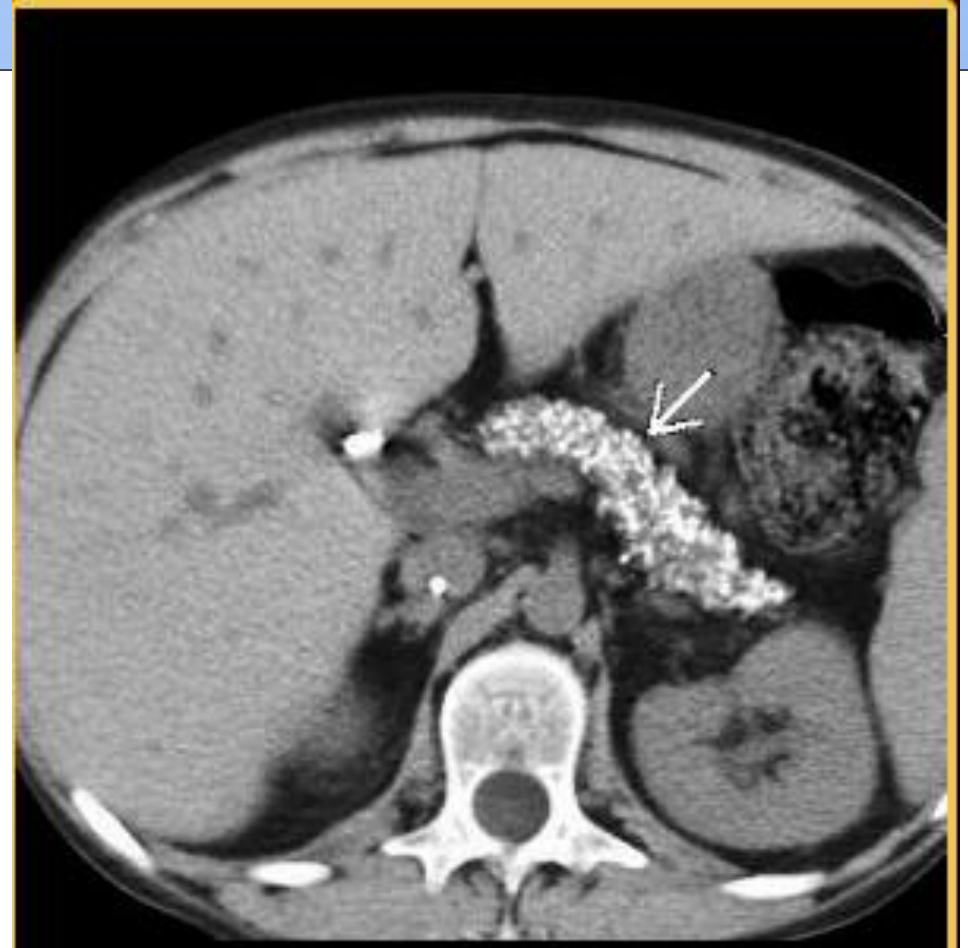
Calcification and atrophy



Chronic pancreatitis: calcifications in the pancreas



Axial CECT shows parenchymal atrophy, calcifications, and small pseudocysts.



Axial NECT of a 27-year-old man with familial pancreatitis shows extensive calcification and atrophy of the pancreas (white arrow). Over 90% of patients with chronic calcific pancreatitis have alcohol as the main etiology. There is a genetic predisposition to chronic pancreatitis, however, and some patients have no history of alcohol use or abuse.

Axial CECT in the same patient shows marked atrophy of the pancreas (white arrow), dilation of the distal pancreatic duct (white open), and varices (white curved) within the pancreas and mesentery due to splenic and portal vein thrombosis.

THANK YOU