

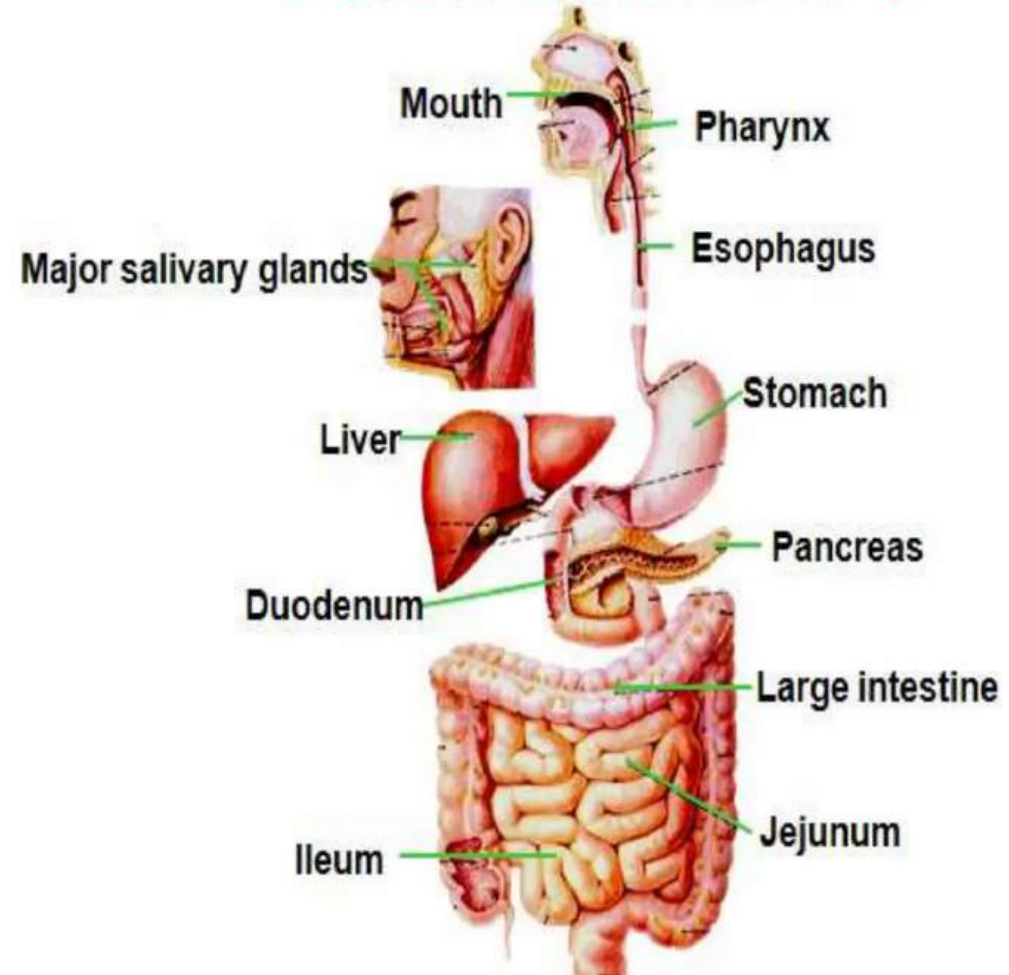


**Round :** ..... Radiology .....

**Group no :** ..... A5 .....

**Done By :** ..... Raneem Abuqtaish .....

# GASTROINTESTINAL TRACT RADIOLOGY



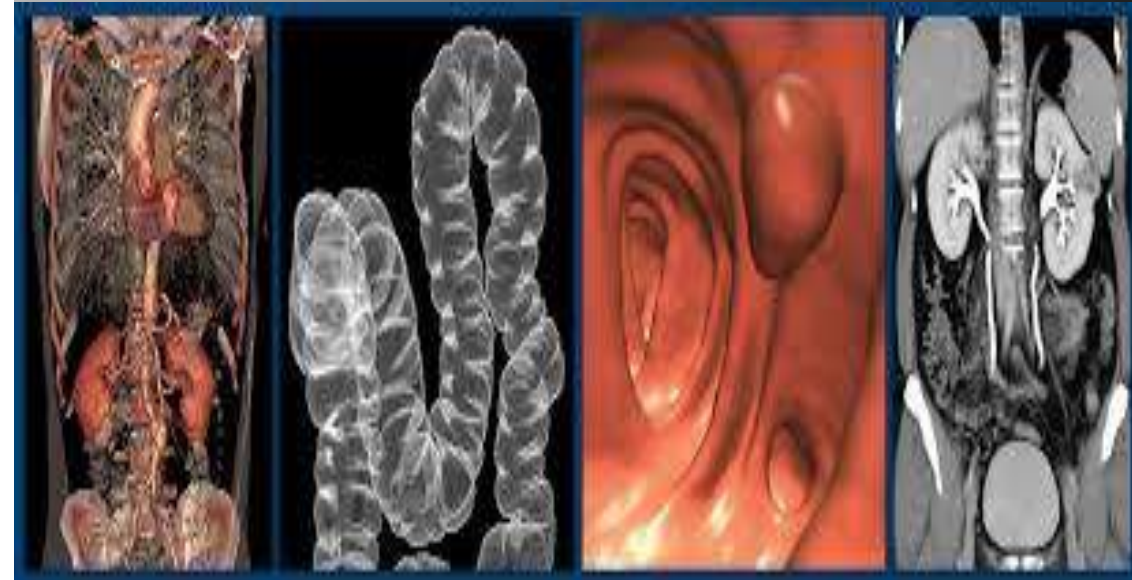
- Dr. Araa Bani-Melhem

## **General Anatomy:**

- The largest cavity of the body,
- Bounded
  - ❖ *Anteriorly* - by abdominal wall muscles
  - ❖ *Posteriorly* - by the vertebral column and posterior wall muscles
  - ❖ *Laterally* - by lower ribs and parts of muscles of abdominal wall
  - ❖ *Superiorly* - by the diaphragm
  - ❖ *Inferiorly* - by pelvic cavity

# IMAGING MODALITIES IN GIT

1. Plain X-rays:
  - Supine
  - Erect
  - Decubitus
2. Barium studies:
  - a. Barium Swallow
  - b. Barium Meal
  - c. Barium Follow through
  - d. Barium Enema
3. Ultrasound Abdomen
4. CT Scan
5. MRI Abdomen
6. ERCP
7. Cholangiography.
8. Angiography and Nuclear Medicine



Surgery → umbilicus  
x ray → first end plate  
L5

# 1. PLAIN ABDOMINAL X - RAY:

## Basic Principles:

\* فائز لا شمس  
عن بعض  
كبر  
difference intensity

### ➤ Five Radiographic Densities:

➤ Gas / Air: Black

\* مبي حى  
نصيرهم

➤ Fat: Dark grey

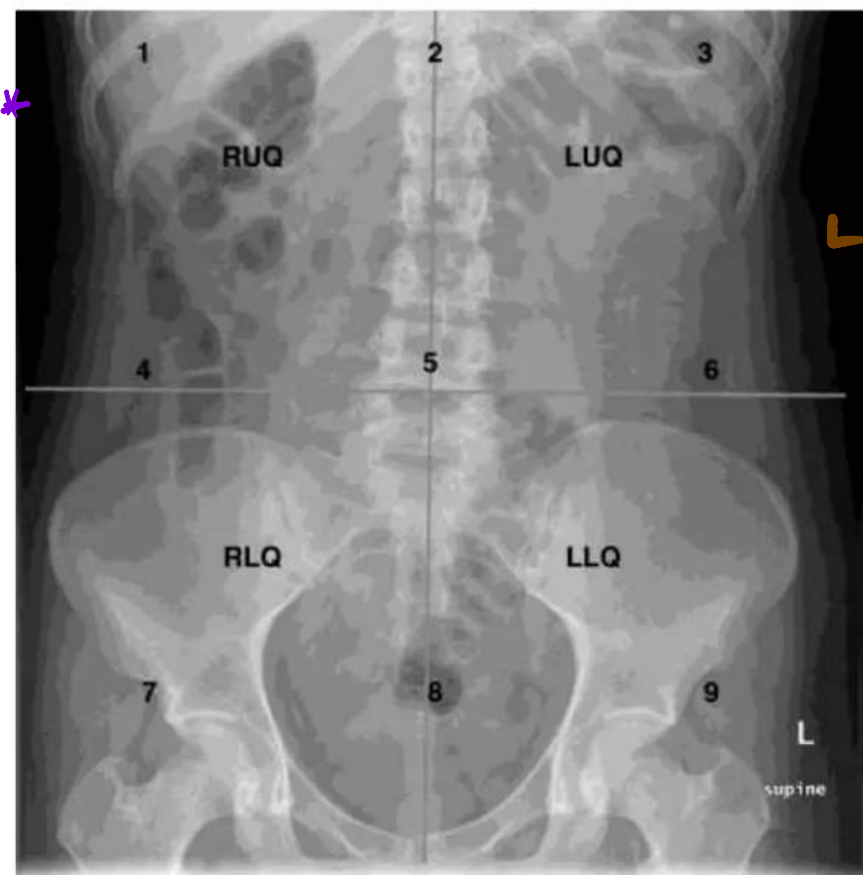
➤ Soft Tissue / Water:

Light grey

➤ Bone/Calcium: White

➤ Metals: Intense white

➤ Interface/line only visible  
when two of these densities  
interface with each other

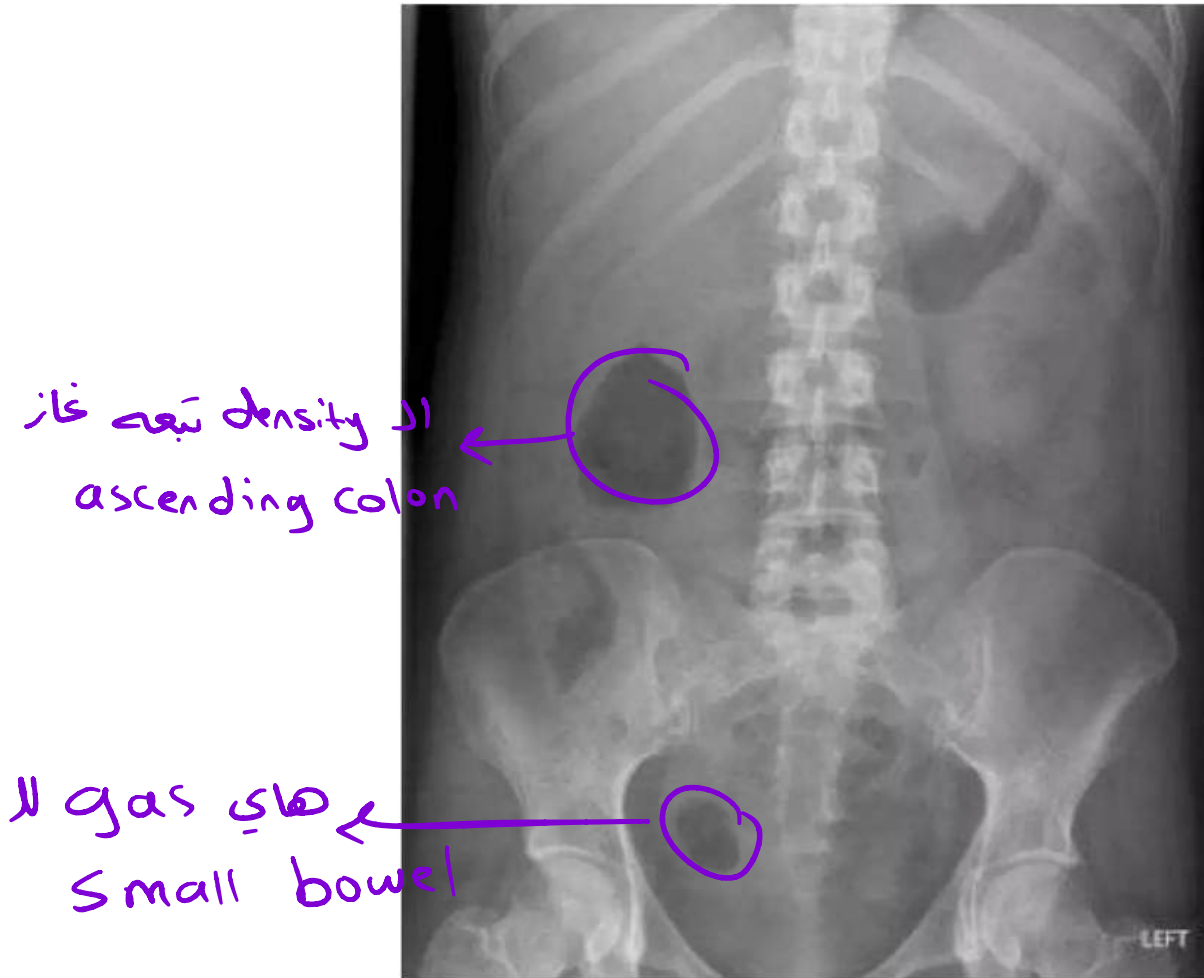


L5 = umbilicus

# Abdominal X-Ray

\* لازم نغرف  
کل عضو ویه  
مکانه کلی ال  
x ray

ال Ureter فا بین  
الاع Contrast



# Abdominal Plain Film

- Convenient and useful initial investigation .
- What to look for ??

1- Gas pattern / Extra luminal air

2- Solid abdominal organs / Soft tissue masses *ex: liver / spleen, ...*

3- Calcifications

*→ size & site*

4- Skeletal abnormalities

5- the visualized lung bases.

*→ Consolidation,  
Pneumonia, effusion*

*→ Contour*

*→ Size*

*→ ex: ankylosing*

*we check the pelvis & lumbar bones →*

*لأنه يكون ممتلئ*

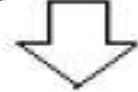
*حقوق  
محمدين*

اسمہ و غرہ

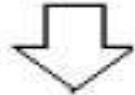
Check patient demographics and the date of the film

Rt or Lt .Supine or lateral

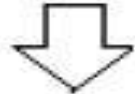
حتیٰ نفوس شو  
نفس قد



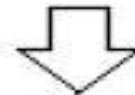
Review the bowel gas pattern and check for free gas



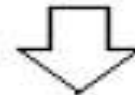
Individually review each of the solid intra-abdominal organs looking for enlargement, abnormal outlines, calcifications or intraparenchymal air



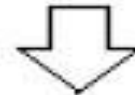
Scrutinise the film for abnormal calcifications and confirm the origin of each.



Analyse the visualised skeleton



Check the visualised lung bases



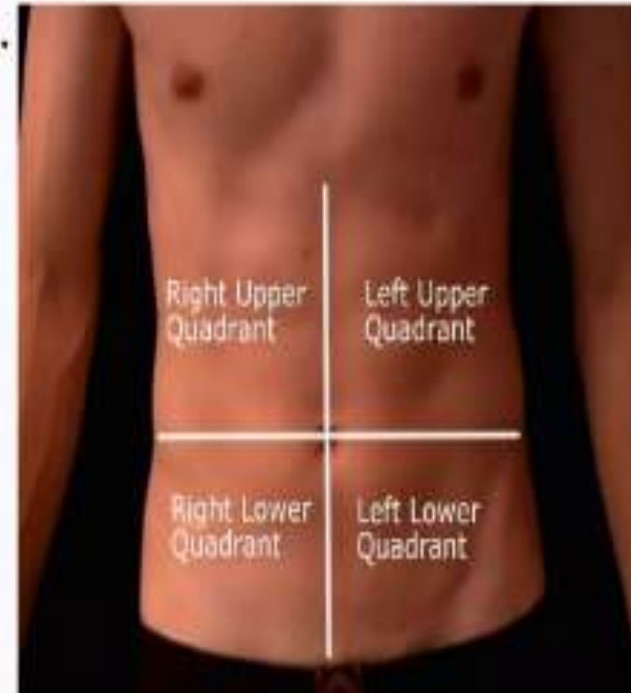
Document your findings in the medical notes

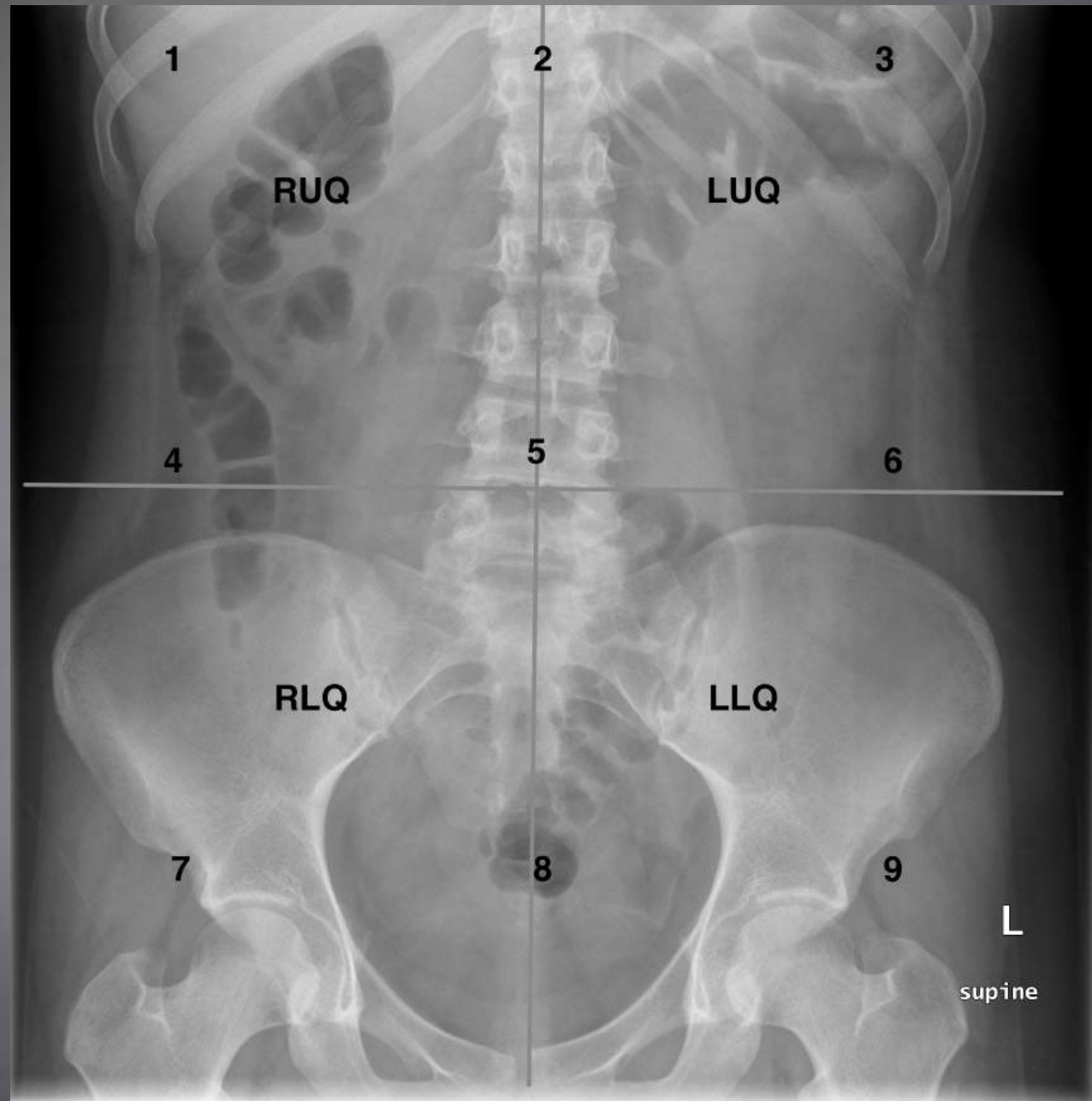
INTERPRETATION

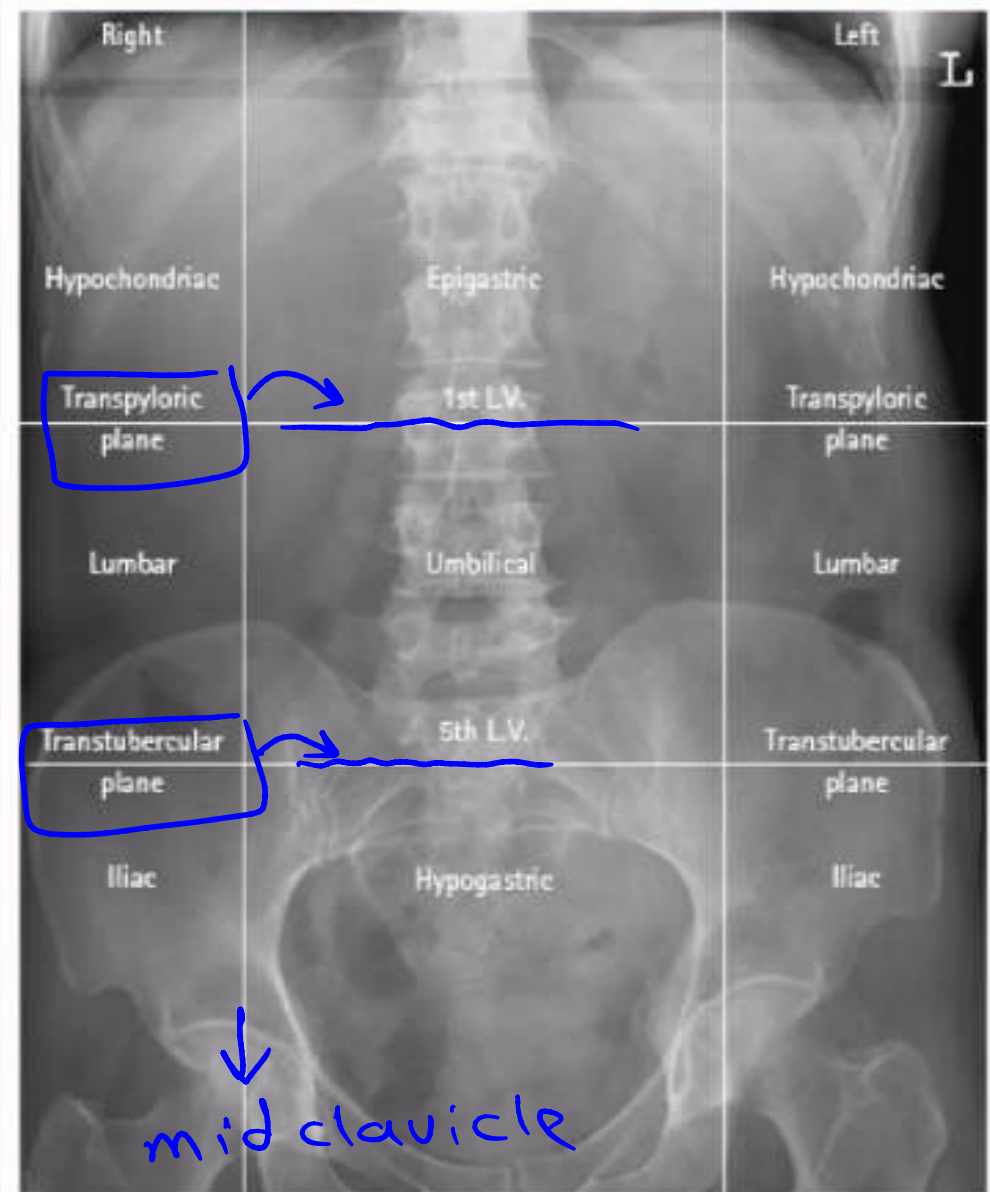
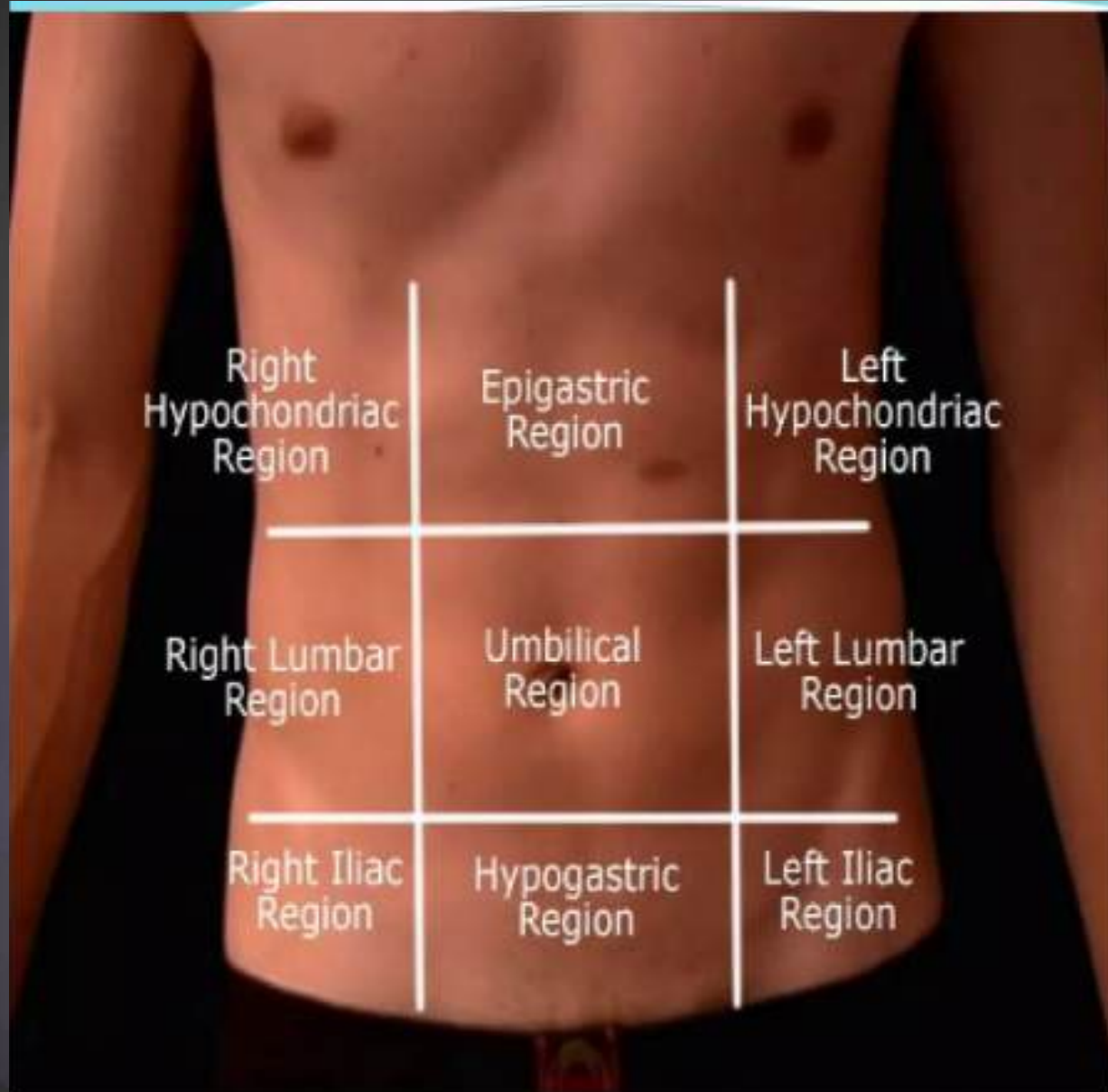
- The standard abdominal radiograph should extend from the diaphragm to the inferior pubic rami, and include the lateral abdominal wall musculature.
  - This results in a standard 'portrait' radiograph.
  - Failure to image the entire abdomen can lead to a misdiagnosis.
- Handwritten notes:*  
borders: diaphragm to the inferior pubic rami → you could find bowel obstruction & inguinal hernia, if you didn't screen the borders you might miss something

## *Planes and regions:*

- Divided either into four quadrants or nine regions
- Divided into four quadrants by a transverse and a mid sagittal plane that intersect at the umbilicus.
- Right Upper Quadrant (RUQ),
- Right Lower Quadrant (RLQ),
- Left Upper Quadrant (LUQ), and
- Left Lower Quadrant (LLQ).



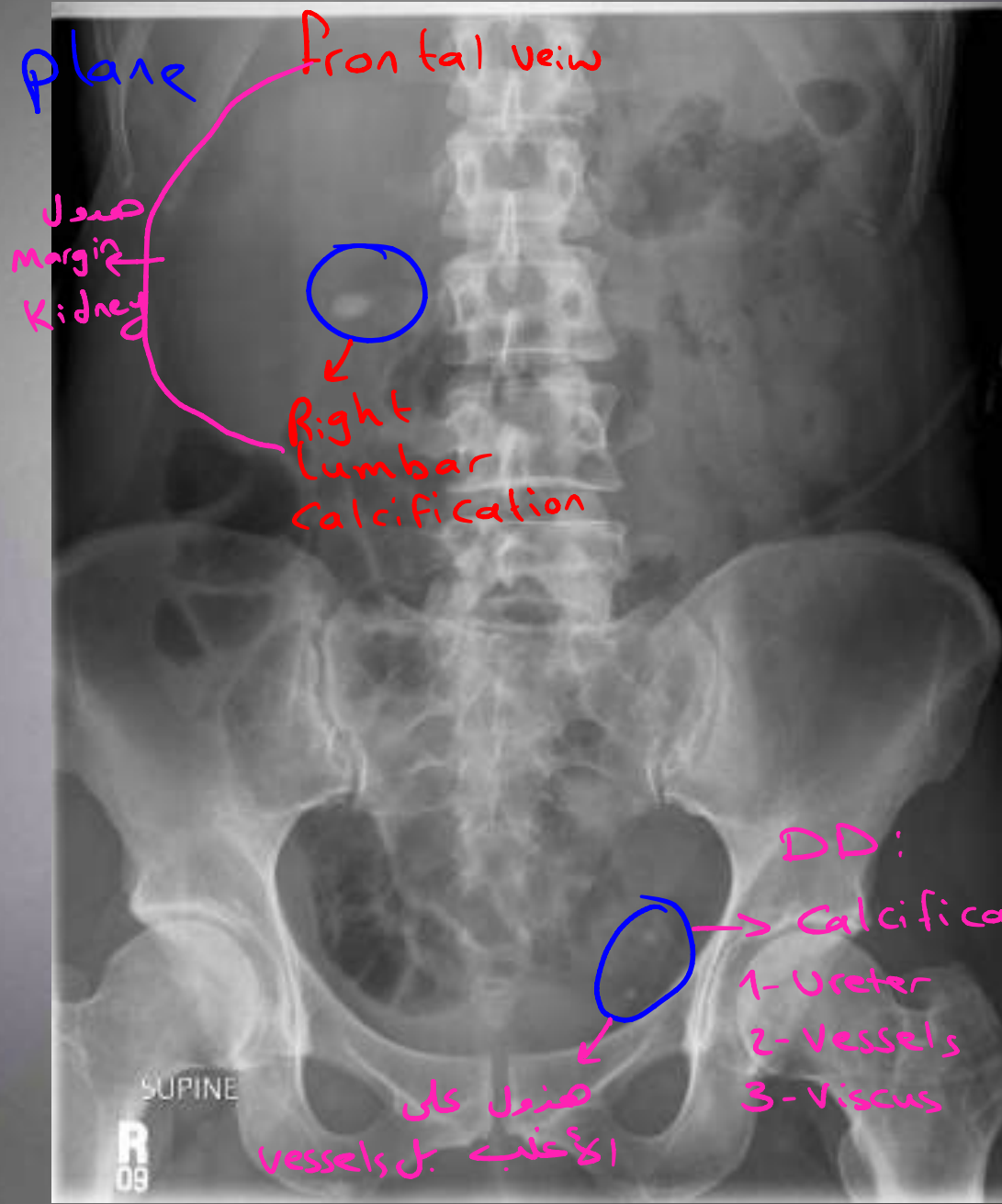




نوع الصورة:  
abdominal x-ray plane

انواع  
x ray / frontal  
lateral

ما في axial و sagittal  
CT



# كل صدول  
gases طبيعي

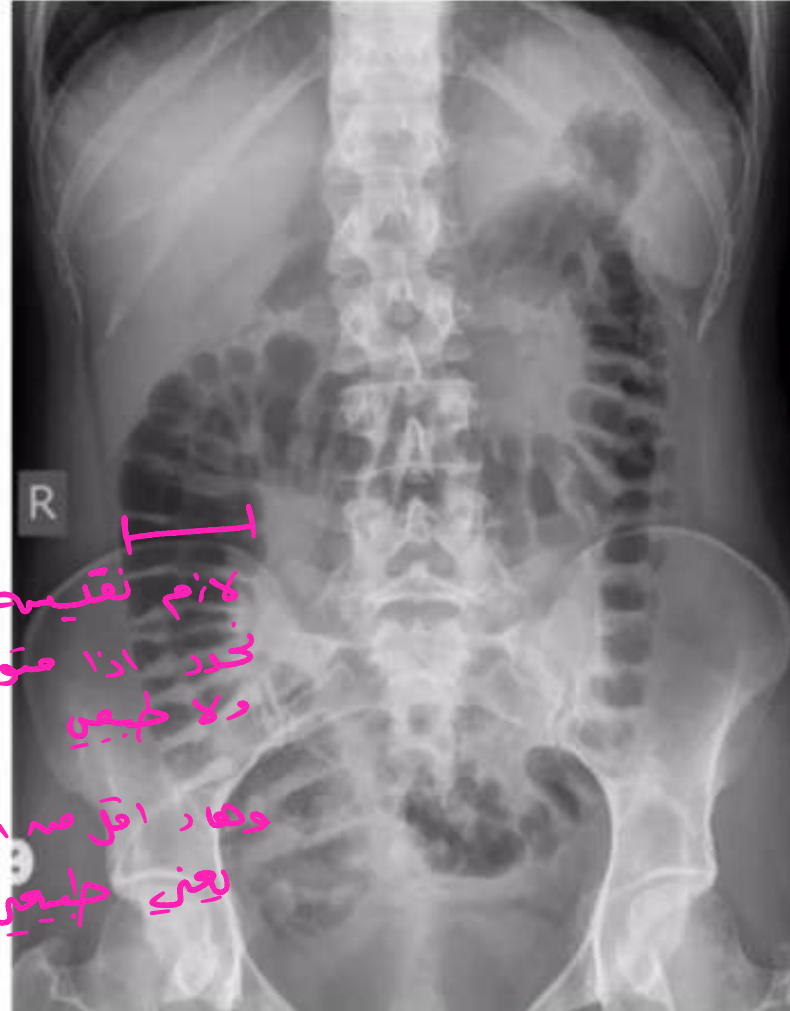
# Gas shadows

## Normal:

- i. Stomach طبيعي نشوف
- ii. Colon فيه gases
- iii. Small Bowel.

## Abnormal:

- i. Within the Lumen:
  - Dilated bowel
  - ? Obstruction
- ii. Outside the Lumen:
  - Free ? perforation
  - In a cavity ? abscess



← دائما فيه gases

# Recognizing small and large bowels عَمِينَ

## Large bowel

- .Peripherally located.
- .Haustral markings do not extent across the wall.
- . Spaced widely apart than valvulae conniventes

## Small bowel

- .Centrally located
- .Valvular marking extends across the lumen → يعني بمشي بل Bowel كامل
- .Spaced much closer قَرِيبِينَ مَهْ بَعْضَ

A rough rule of 3-6-9 is followed to determine the diameter of small and large bowel.

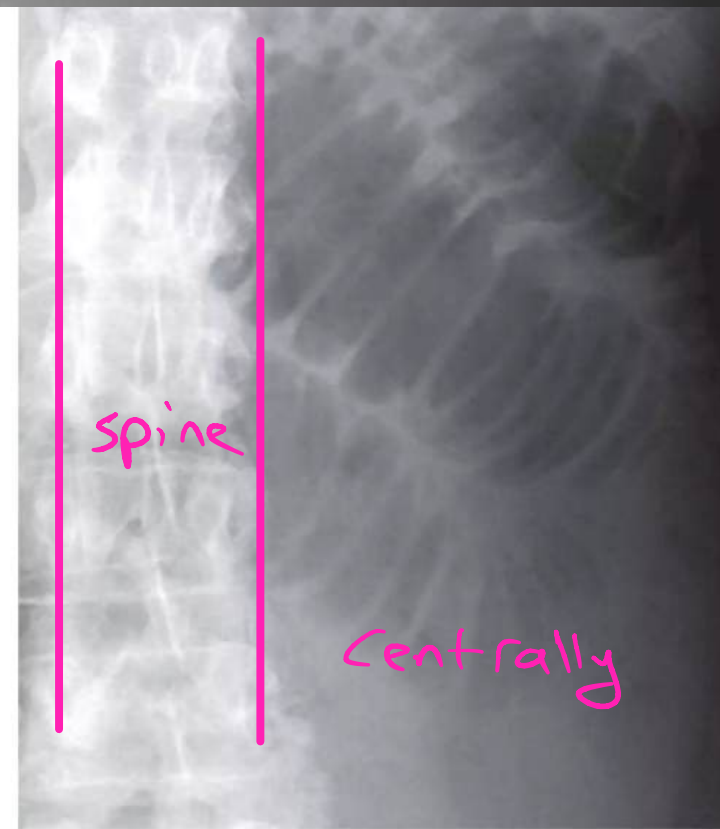
diameter  
S.B. → large bowel  
cecum

Large Bowel



هورة خارجية  
من تشوفو  
Haustral Markings

Small Bowel



# Plain Films: Abdominal X-Ray (AXR)

## Findings: Small (SBO) vs. Large Bowel Obstructions (LBO)

- Look at caliber, lines, and location to differentiate SBO vs LBO
- Air fluid levels on upright x ray are neither specific nor sensitive and cannot help distinguish ileus, enteritis, or partial from complete SBO



**Small Bowel Obstruction**

| SMALL                                                  | LARGE                            |
|--------------------------------------------------------|----------------------------------|
| 3cm max diameter                                       | 6cm max diameter                 |
| Lines all the way across the bowel (Plicae Circulares) | Lines not fully across (Haustra) |
| Central                                                | Peripheral                       |



**Large Bowel Obstruction**

# Abnormal gas patterns

صفحة  
فهم

## Causes of Extra-luminal gas:

- Post Abdominal Surgery/ERCP
- Perforation of viscus (eg. bowel, stomach)
- Gallstone ileus
- Cholangitis (infection with gas forming organisms)
- Abscess

أولاً استي لا gases تأكد انه المريض مس ←  
لانه يصل بعد العملية من 3-5 أيام

أولاً D.D. ←  
تفكر فيه

Gal stone ←  
يطلع من جدار

GB و بروز  
للإفصاض يصل  
Valve و تقفل  
obstruction

بهاي الحالة فيشوف  
Small bowel & Stone  
Pneumobilia

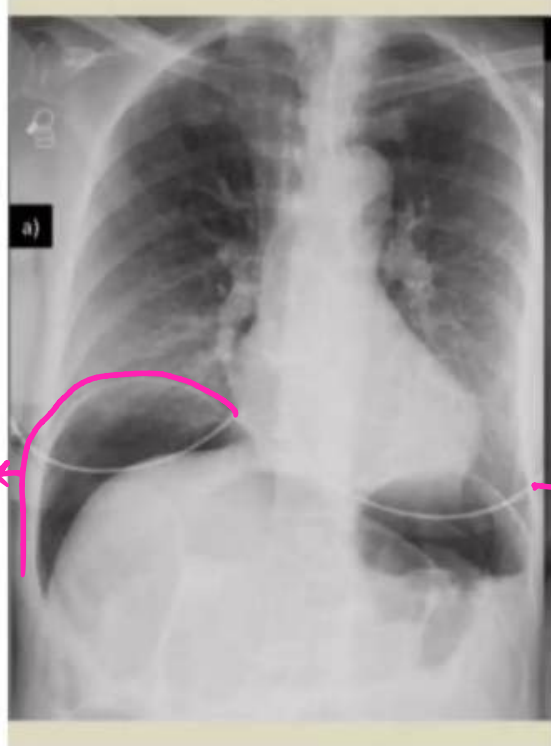
”الصورتين الهواء يكون“

Bilateral

# Pneumoperitoneum

An erect CXR (not AXR) is the best projection to diagnose a pneumoperitoneum (gas in the peritoneal cavity).

## Recognizing abnormal Air



diaphragm

هناك  
عن أواني  
المريض

Pneumoperitoneum (crescent sign)

under diaphragm



والباطنة  
ما من شئ  
لكن هو عن  
عن هوا شئ  
liver

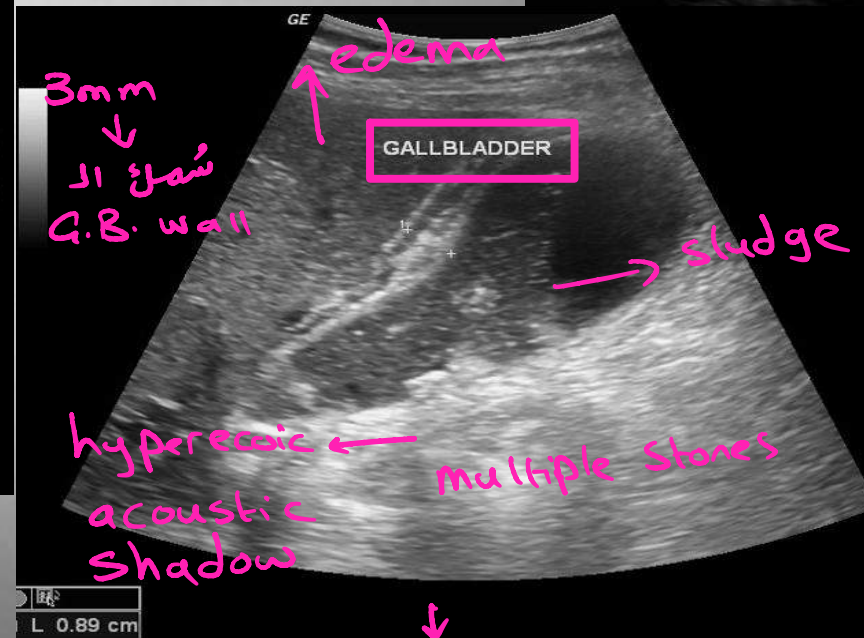
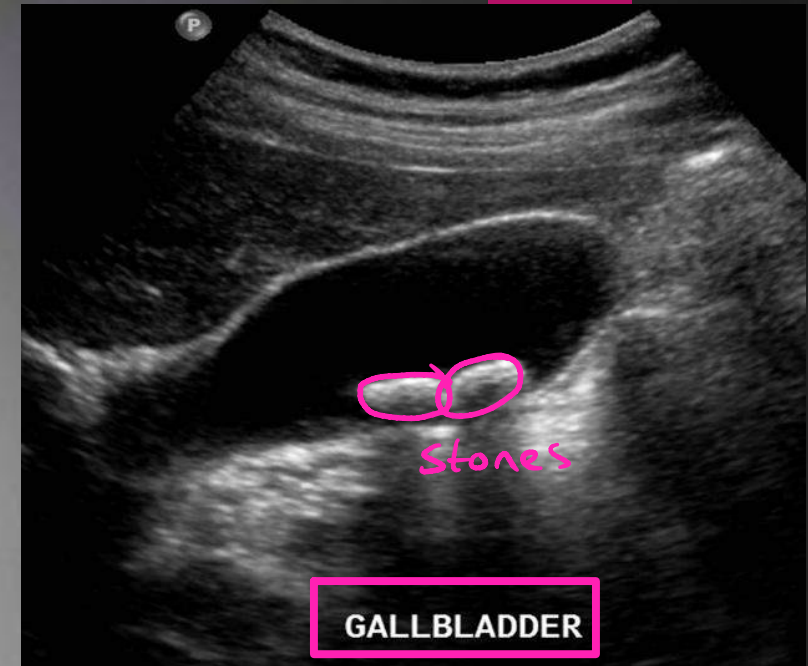
بربط  
abdominal  
wall

sign for Pneumoperitoneum  
Falciform ligament sign

# ultrasound

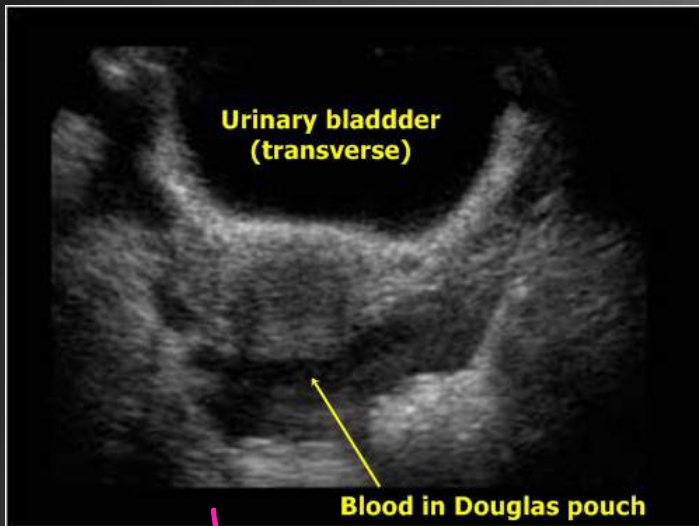
- High-frequency sound waves to characterize tissue.
- Readily Available.
- Flexible
- Convenient and less costly.
- It is particularly useful for the assessment of solid organs and fluid-filled structures.

\* فحص فطولي قود الـ vessels  
داخل الكبد مع هاي الصورة



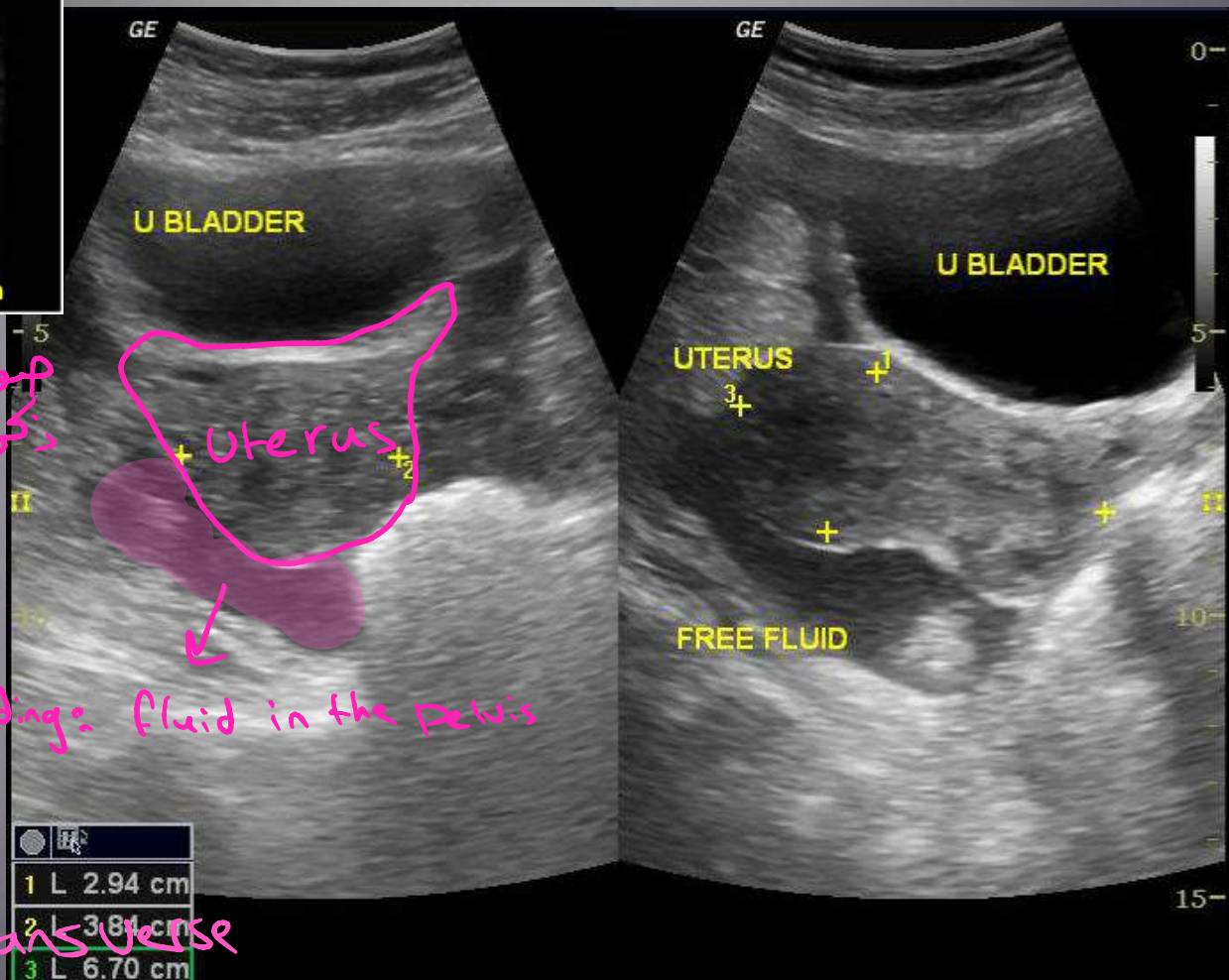
↓  
diagnosis: Cholecystitis

# "Pelvis US"



↓  
صورة خارجية عن الكوة  
دكتن تجمع سوائل  
Douglas Pouch

abnormal findings: fluid in the pelvis



US views → transverse  
→ longitudinal

تختلف لونه  
X-ray غن

gas & stones

↓  
white on US

Soft tissue  
↓  
grey

# Barium studies

- Diagnostic tests used to assess GI system using X-ray imaging in the setting of administration of contrast agents.

مرتبة 1 ← 3  
حسب الأولوية  
الاستعمال

## Contrast Medium for GI

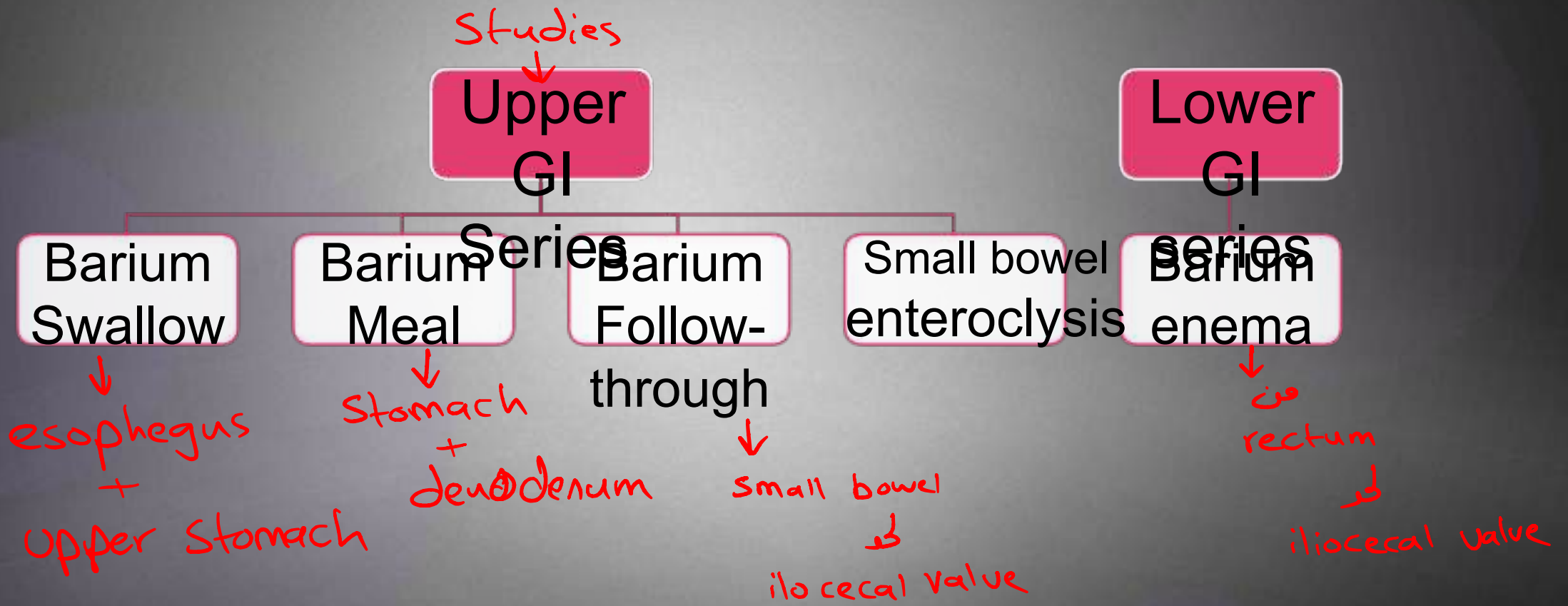
### Water Soluble

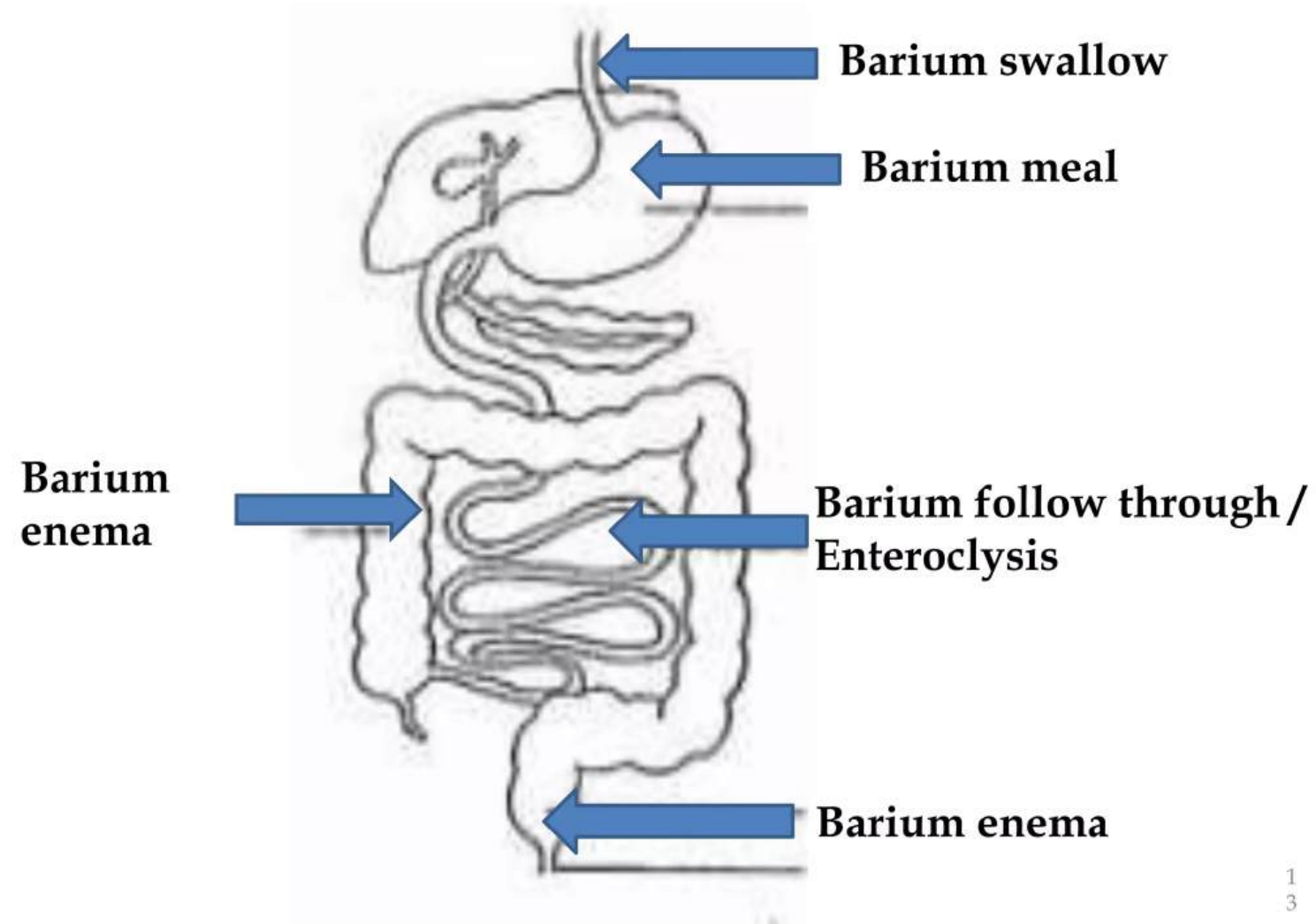
- ② Ionic (gastrografin) Can lead to pulmonary edema if aspirated.

- ③ • Non- Ionic ( Low Osmolar) Relatively safer if aspirated.
  - Gadolinium (MRI)

- ① Barium ( Non-water soluble)
- Can cause sever peritonitis and fibrosis in perforation or leakage.

جودة أحسن →  
لكن لو في  
أي امي من  
يلي تصههم خط  
ما بصير استعمال





# Barium swallow

- Examination of the pharynx, esophagus and proximal stomach (reflux).

- Barium sulfate \_ single/(double) contrast

- Non-ionic ( infants)

Barium & air

water soluble عامل غليظ حبيبة عسقل

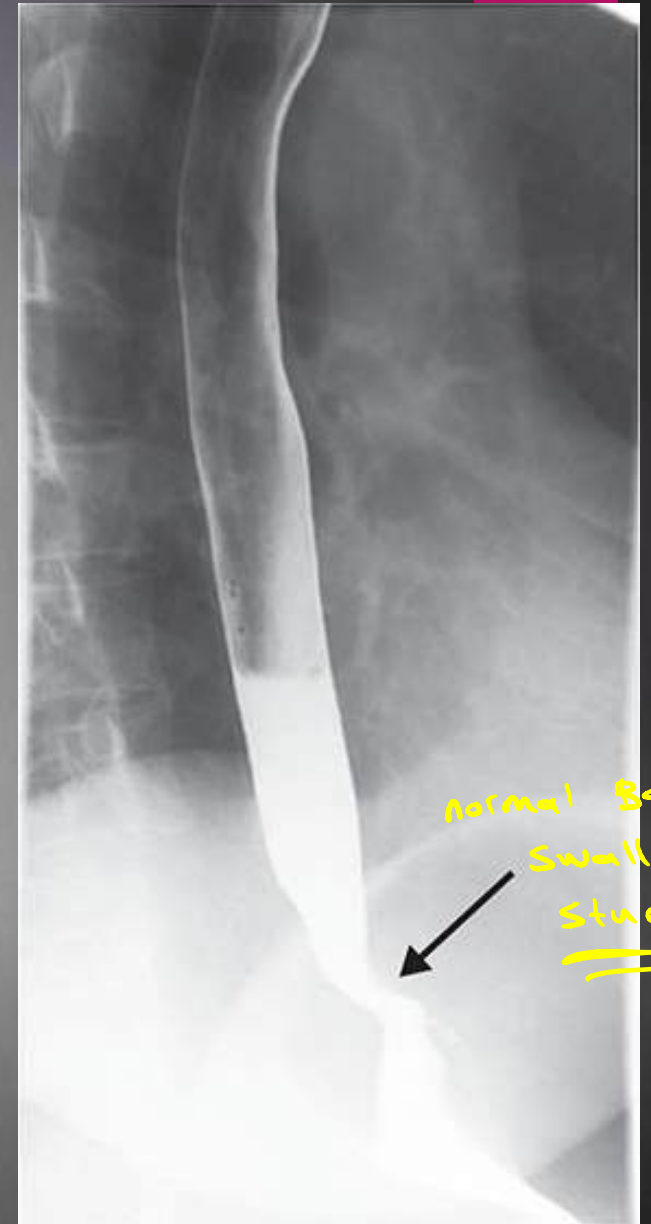
عَنْسِلَرُ عَلَى هَدُول  
كَلِمَ حَتَّى نَتَأَكَّرَ أَنَّهُ

Normal Swallow

ع

Normal  
swallow

- Smooth outline
- No focal dilation or stenosis
- No Outpouchings
- No filling defects
- Smooth tapering
- Gastroesophageal junction
- No Reflux
- No Leak



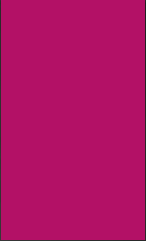
# Barium Esophagram: *Anterior-Posterior View*

made with  
**flixier**

شرب واحدنا  
فمنصوره video

orally واحدنا منصوره  
frontal ← على ٣ جهات  
oblique ←  
lateral ←

يعني لازم شرب  
٣ مرات عشان  
يظهر ٣ جهات



# Pathologies to look for in barium swallow

# ← Achalasia failure to relax

فشل

a failure of organized esophageal peristalsis that causes impaired relaxation of the lower esophageal sphincter, resulting in food stasis and often marked dilatation of the esophagus.

احنا فنشوف  
Barium بلون ابيض  
بي حنقد نجلي  
البهاز Negative  
نشفنا اسود

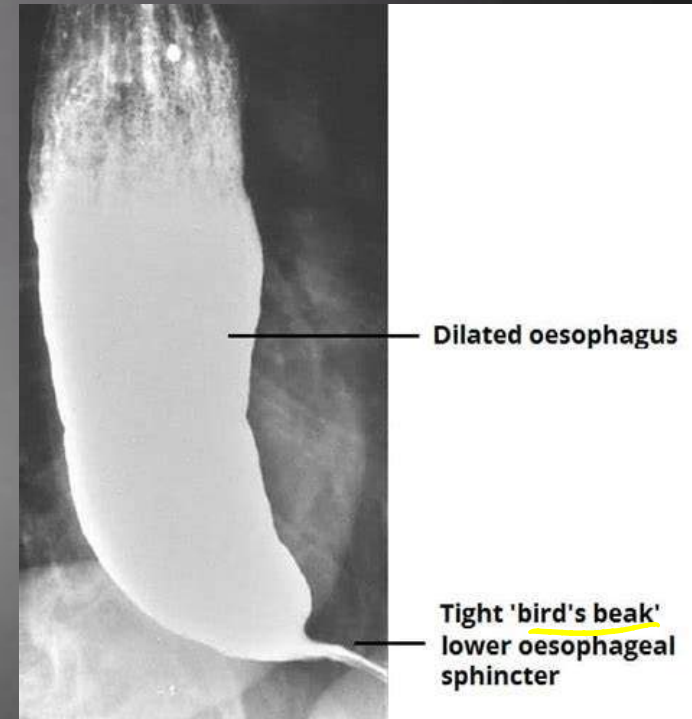
## \* Dreaded Complications: esophageal carcinoma

- thought to occur because of chronic irritation of the mucosa by stasis of food and secretions

## aspiration pneumonia:

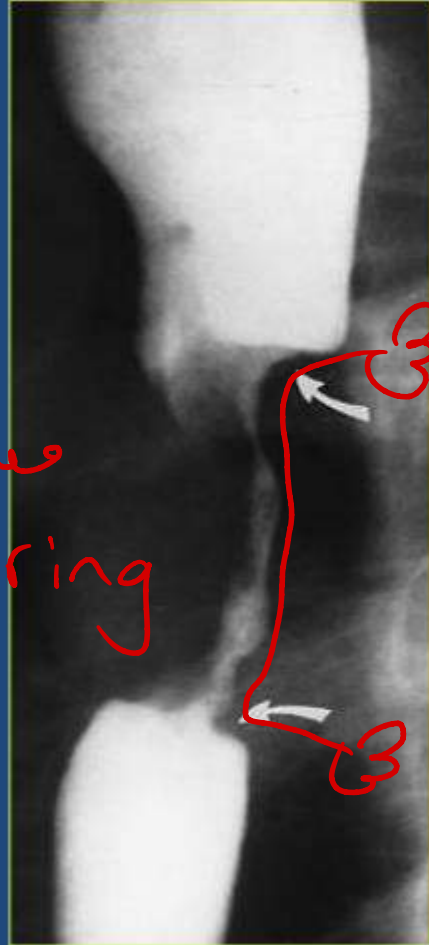
the chronic presence of fluid debris in the esophagus makes patients very prone to aspiration

## candida esophagitis



↑ rat tail sign  
اسم آخر

فسيما  
Shouldering



### Malignant Stricture

- Abrupt narrowing with irregular mucosa
- The prominent shoulders are characteristic of tumor

قسي  
Cut  
tapering

# Barium meal

- Examination of the stomach and duodenum .
- -Single contrast .

-Double contrast is obtained by introduction of <sup>air</sup> gas into the stomach using effervescent powders and barium. (Mucosal details)

## Indications :

- Gastro esophageal reflux
- Gastric or duodenal ulcer
- Hiatus hernia
- Suspected gastric tumor
- Contraindications: ( Water-soluble contrast used )
- Suspected perforation.
- Completely bowel obstruction.
- Suspected Fistula.

## Barium meal (Single & Double)



Stomach  
فأفیف  
هون

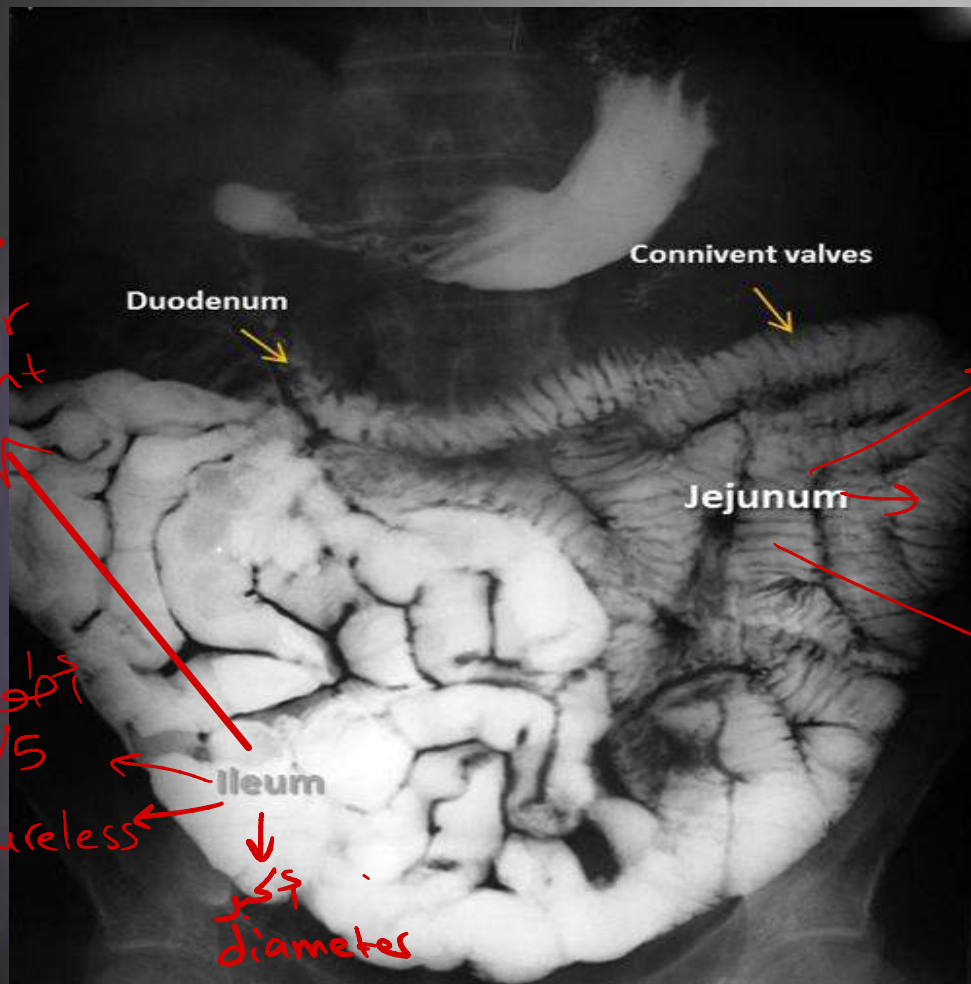
Single  
no mucosal details



Double  
mucosal details

ileum و Jejunum

## Barium follow-through



ممكن  
left upper

Examination of the small bowel with contrast traversing through the small bowel into the large bowel.

أفقر  
2/5

### • Indications:

- Small bowel pathologies as :

tumors, inflammatory bowel diseases, obstruction.

في  
Features

# Barium enema

- Examination of the large bowel with double contrast (Barium and air).
- Introduction of contrast into the rectum through a Foley's catheter .

## Indication :

- Investigation of abdominal mass
- Large bowel obstruction / volvulus.
- Diverticular disease
- Suspected colonic tumor

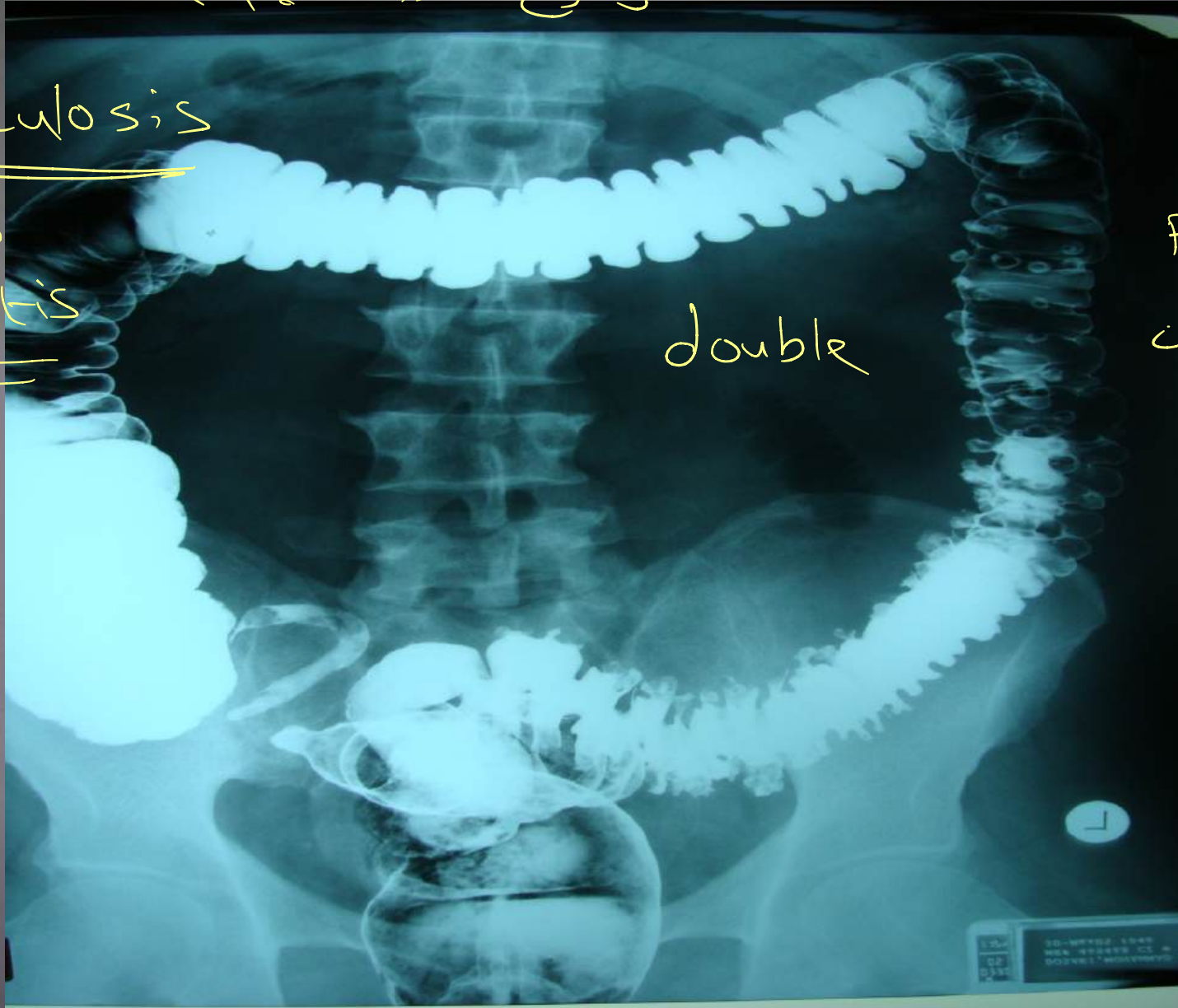
Barium enema

diverticulosis

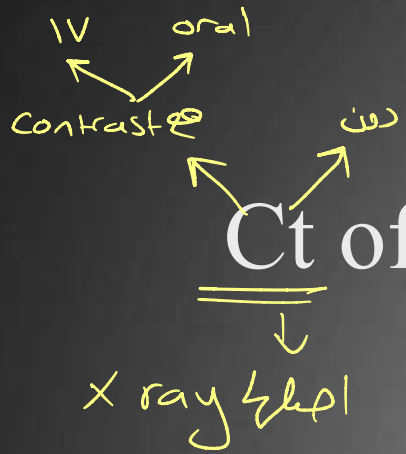
في

diverticulitis

double



من (FAP) Polyps  
جيبات داخل القولون  
بك بالصورة هنا  
out-pouches لبرا



fluoroscopy لكن  
يكون dose  
فيه أعلى من  
CT

CT  
اكثر في صورة  
dose أعلى  
من  
X-ray

An imaging modality that uses x-rays to build cross-sectional images ("slices") of the body.

لو كنده  
حساسيه بيض  
او حليب او  
فحمه زبوره  
اندا كنا محتاجين

Unenhanced vs with contrast

Precautions and preparations:

contrast allergy? Asthma? Medications ? KFT? Fasting?

براجع المسالك  
لو كان عالي دوا صغيره  
الا اذا طايء ومنغسل كليته

IV → detect all organs

→ Iodine عادة

منخله من Artery

زي radial A. من ليد

Indications:

abdominal pain, flank pain, pelvic or inguinal pain

suspected abdominal or pelvic masses or fluid collections

primary abdominal tumors or metastatic spread

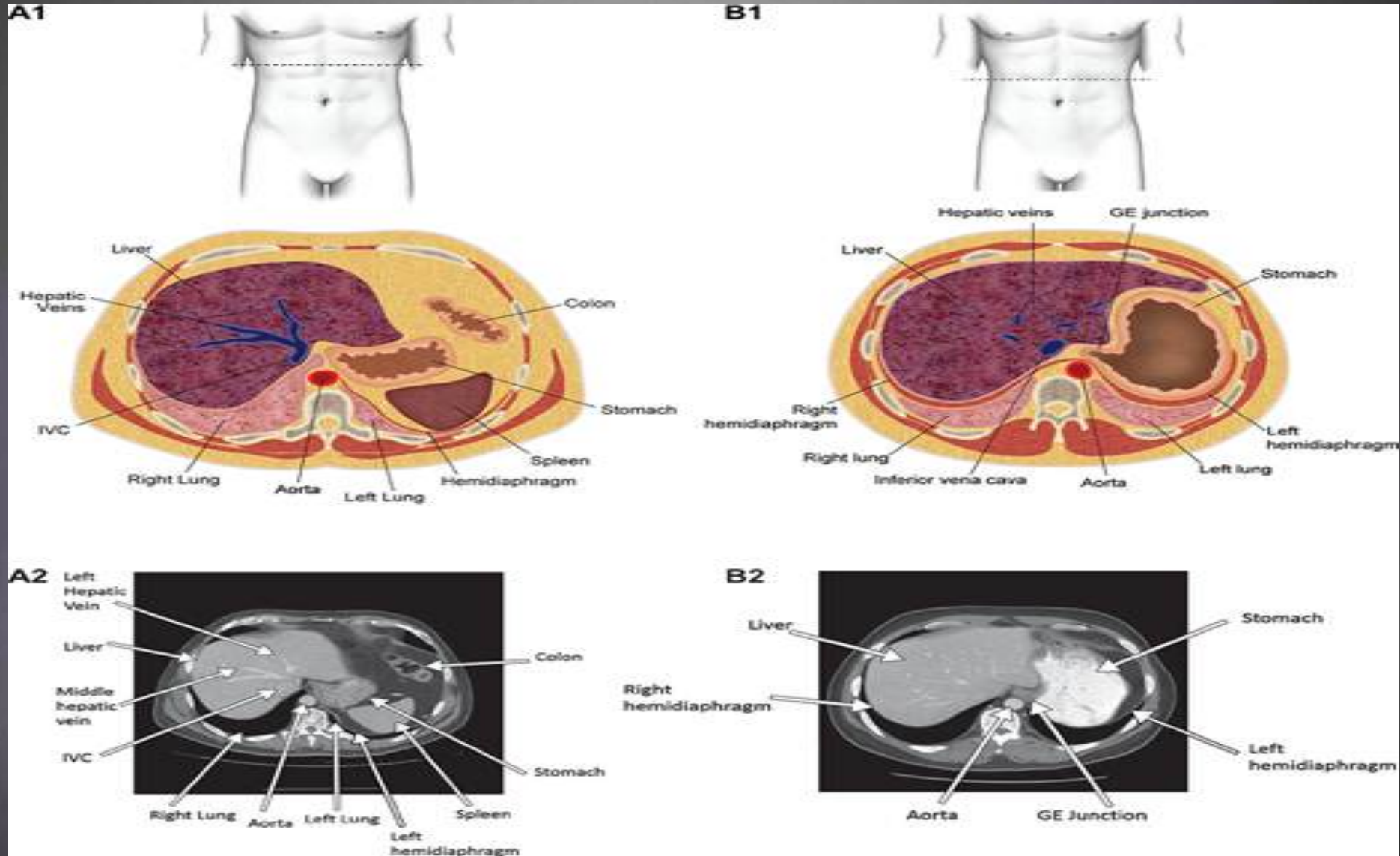
infections and inflammatory conditions of the abdomen and pelvis including abscesses

موصى  
صدا

↓  
لازم يكون  
صائم

metformin  
Thyroid medications

# Ct anatomy of GIT



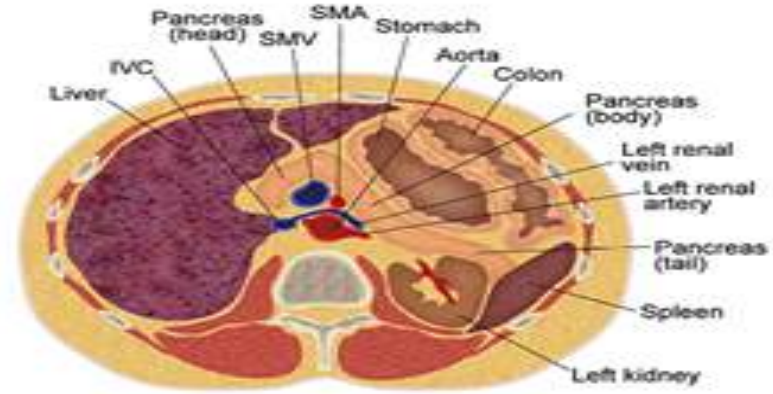
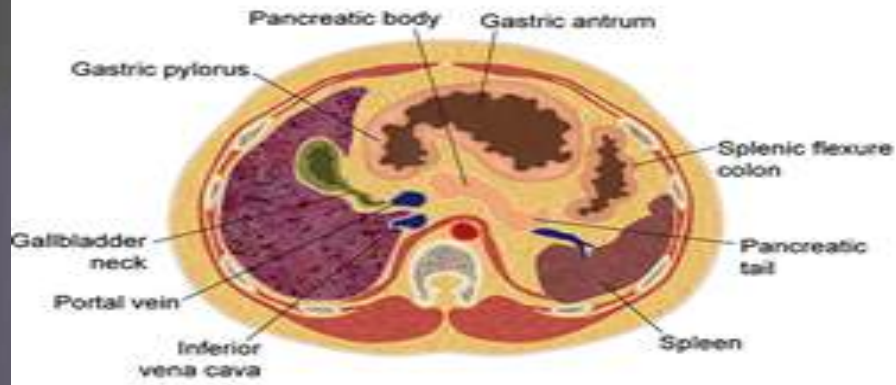
A1



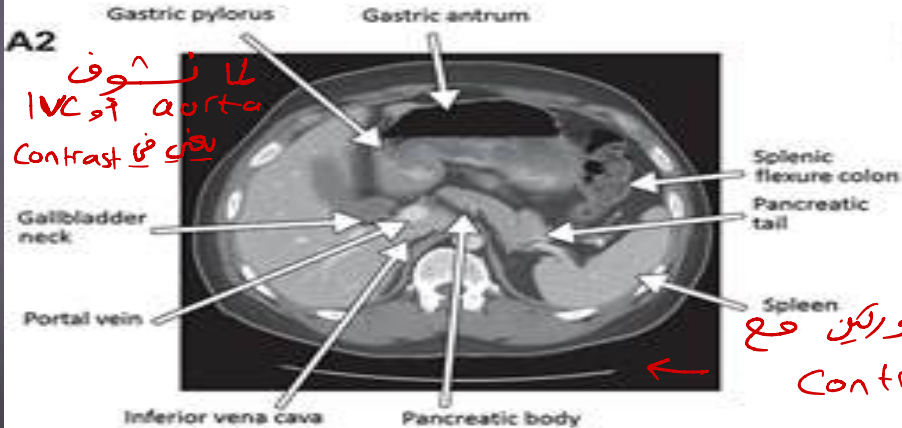
B1



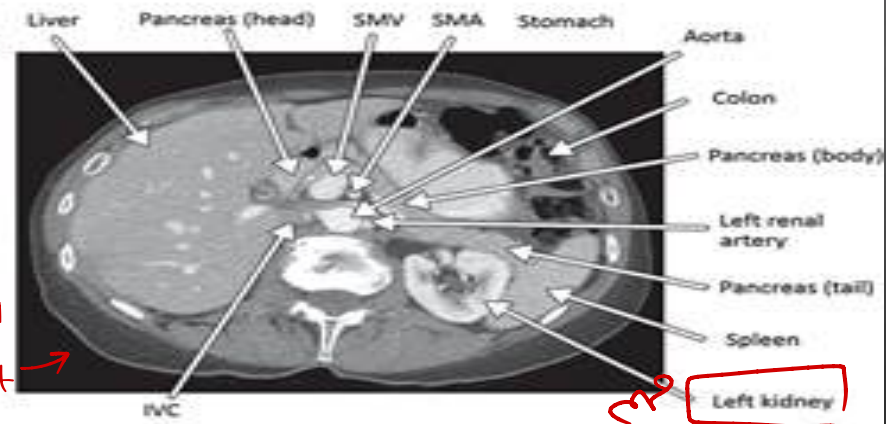
الصورة هاي مهمة

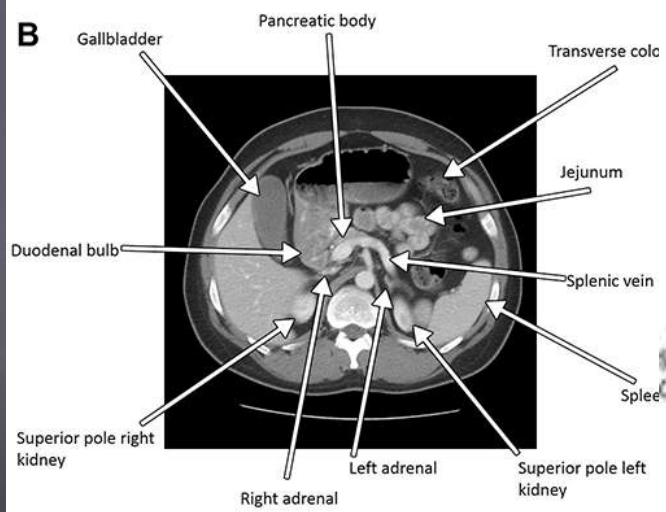
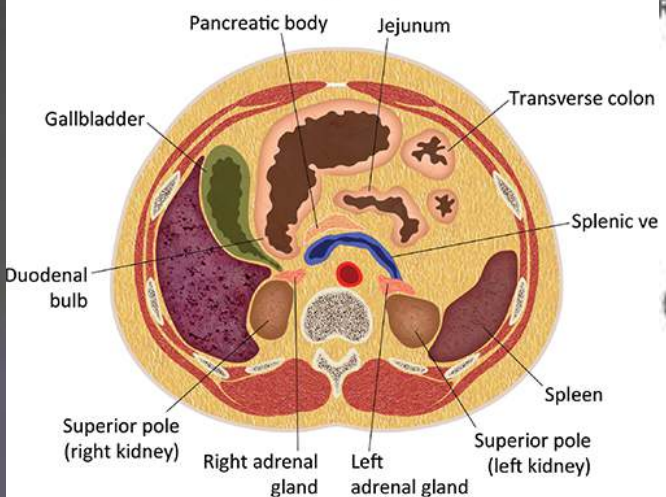
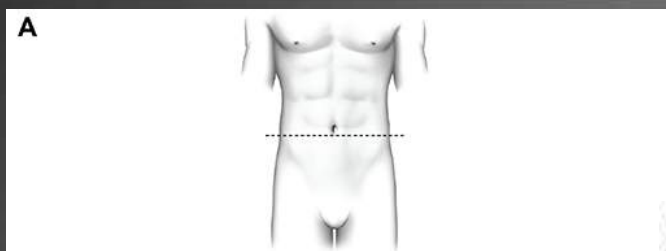


A2



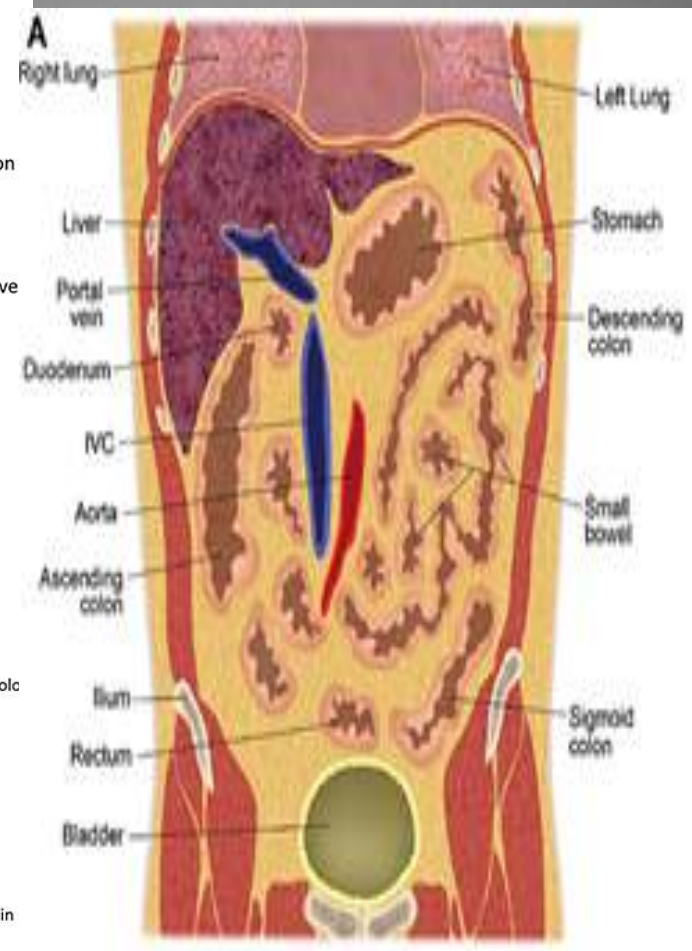
B2



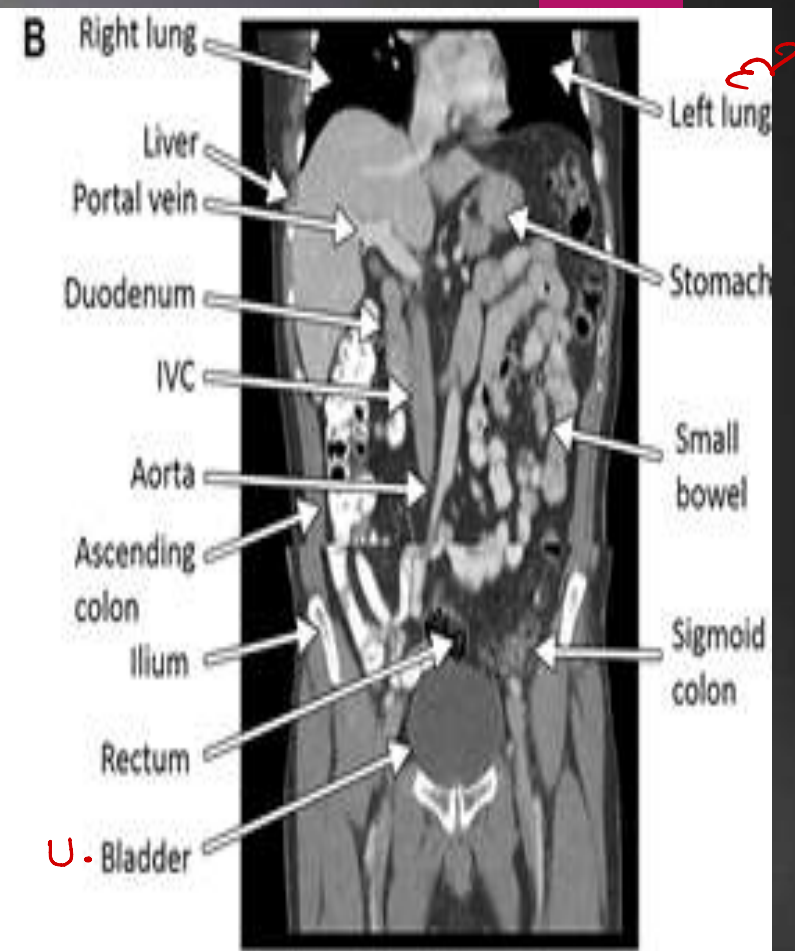


Source: Khaled M. Elsayes, Sandra A. A. Oldham: Introduction to Diagnostic Radiology: www.accessmedicine.com  
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# Phases of contrast : ترتيب من مبش يضي  
1. arterial phase : aorta



Source: Khaled M. Elsayes, Sandra A. A. Oldham: Introduction to Diagnostic Radiology: www.accessmedicine.com  
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2. Portovenous : aorta + IVC  
3. delayed phase: Kidney has colour + IVC

ما فيها radiation "سعرها فيها"

# MRI of the abdomen

- Outstands CT , with less risk of radiation for assessment of several solid abdominal and pelvic organs
- Assessment of vessels ( MRA)
- Assessment of biliary tree ( MRCP)