



# Anatomy and Techniques used in Imaging the Gastrointestinal Tract

**AHMAD AMER AL-BOUKAI**

**Consultant Radiologist  
Radiology & Medical Imaging Department  
King Khalid University Hospital  
2011**





# OBJECTIVES

- ✓ Discuss imaging modalities utilized in the evaluation of the gastrointestinal tract.
- ✓ Discuss the indication, contraindication, preparation of various techniques utilized in the evaluation of the gastrointestinal tract.
- ✓ Discuss the radiological anatomic features related to gastrointestinal structures.





# **IMAGING MODALITIES**

*Imaging modalities utilized in evaluation of Gastrointestinal Tract:*

**PLAIN FILM**

**FLUROSCOPY**

**COMPUTED TOMOGRAPHY**

**MAGNETIC RESONANCE IMAGING**

**ULTRASOUND**

**ANGIOGRAPHY**

**ERCP & PTC**

*It is dynamic type of study :*

- Barium swallow
- Barium meal
- Barium follow-through
- Small bowel enema
- Barium enema





# **IMAGING MODALITIES**

*Imaging modalities utilized in evaluation of Gastrointestinal Tract:*

## **PLAIN CONVENTIONAL FILM**







# IMAGING MODALITIES

*Imaging modalities utilized in evaluation of Gastrointestinal Tract:*

## PLAIN CONVENTIONAL FILM

### ➤ Normal

- The routine projection is **supine film**; however erect film is taken in certain cases in particular patients with suspicious of intestinal obstruction to check for air-fluid levels.
- Lateral decubitus film may be taken in very ill patients instead of erect one.





# IMAGING MODALITIES

*Imaging modalities utilized in evaluation of Gastrointestinal Tract:*

## PLAIN CONVENTIONAL FILM

- Normal
- Acute Abdomen
- Masses
- Inflammatory Processes

Intestinal Obstruction  
Pneumoperitonium  
Calculi /stones  
Masses





# IMAGING MODALITIES

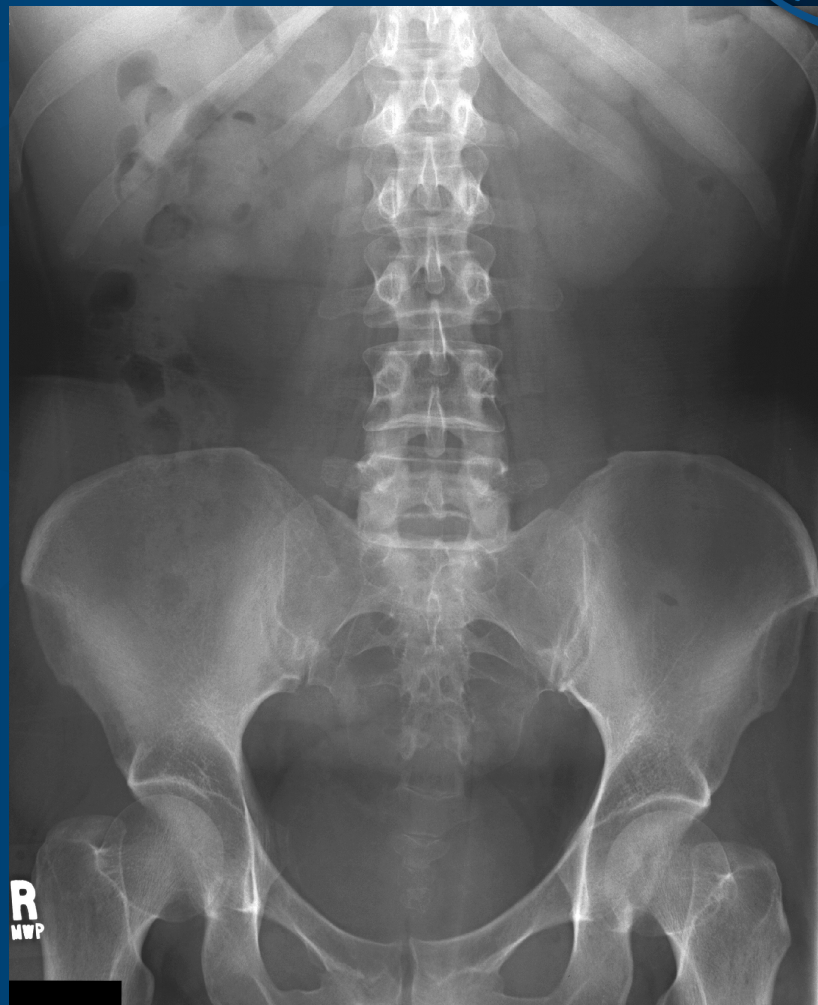
## PLAIN FILM - NORMAL

Image key = shades

White ----- bone and calcification

Black ----- air

Grey ----- soft tissue



*A A AI-BOUKAI*

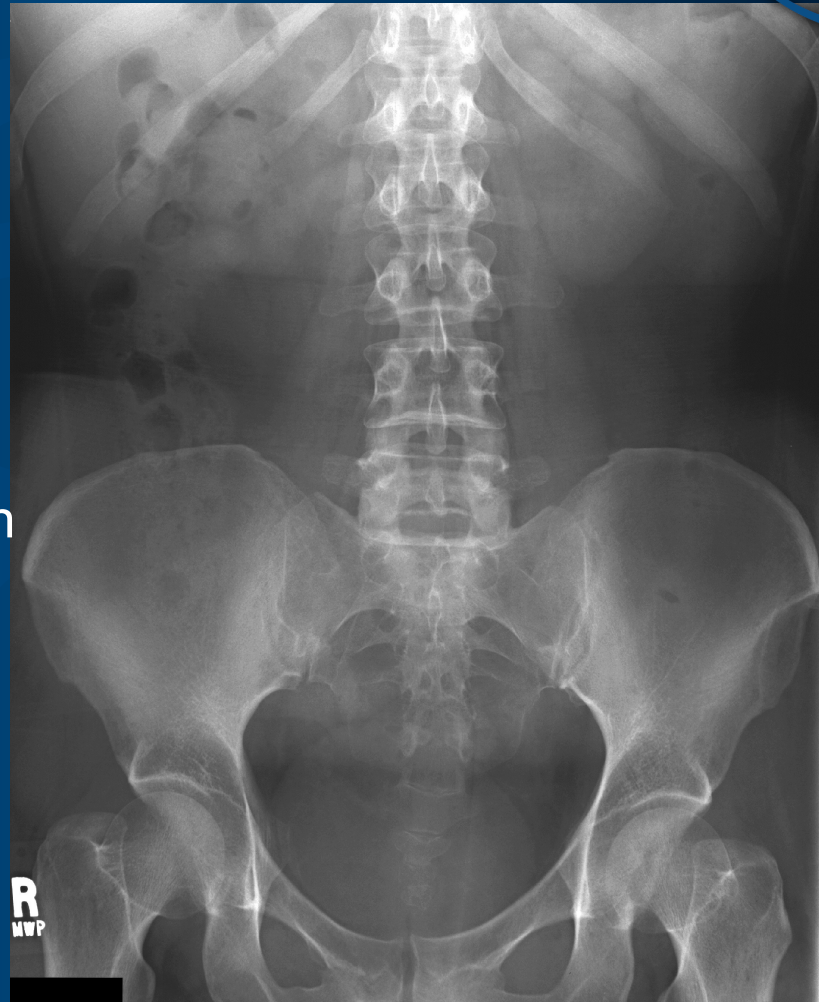


# IMAGING MODALITIES

## PLAIN FILM - NORMAL

“What to look for?”

- ✓ Soft Tissues
- ✓ Stomach & Bowel gas distribution
- ✓ Bones & calcifications



*A A Al-BOUKAI*

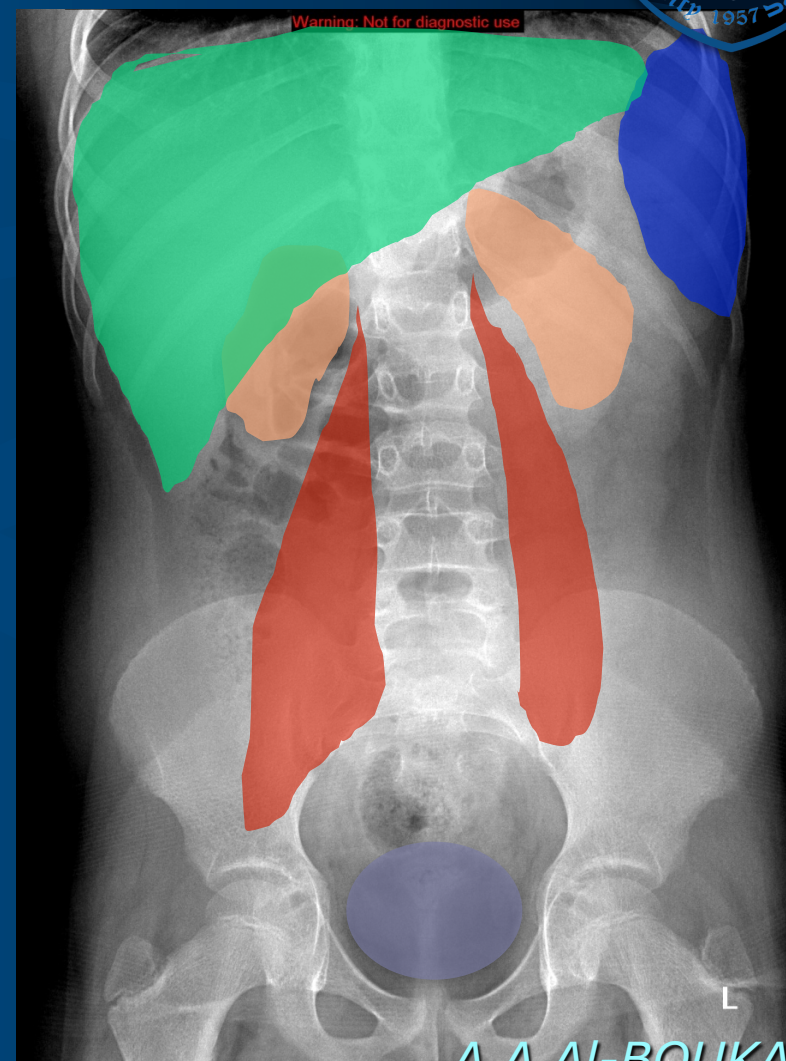


# IMAGING MODALITIES

## PLAIN FILM - NORMAL

### Soft Tissue

- Liver
- Spleen
- Kidneys
- Urinary bladder (filled)
- Psoas muscles

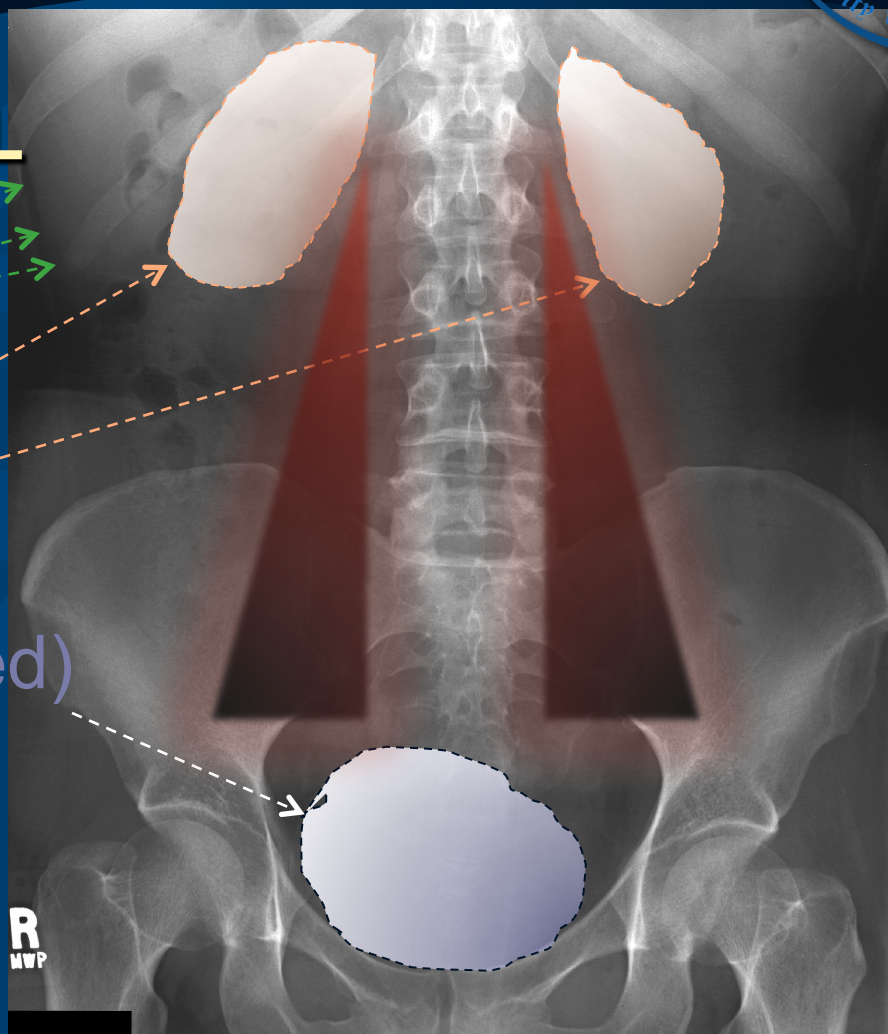




# IMAGING MODALITIES

## PLAIN FILM - NORMAL

- Liver
- Spleen
- Kidneys
- Urinary bladder (filled)
- Psoas muscles





# IMAGING MODALITIES

## PLAIN FILM - NORMAL

### Normal gas pattern

- Stomach, in the epigastric area  
Should be present unless “vomiting / NGT”
- 2-3 loops of non distended small bowel  
Less than 2.5 cm in diameter
- Always air in the rectum or sigmoid  
contain stool
- Small vs Large Bowel distribution



A A AI-BOUKAI

# IMAGING MODALITIES

## PLAIN FILM - NORMAL

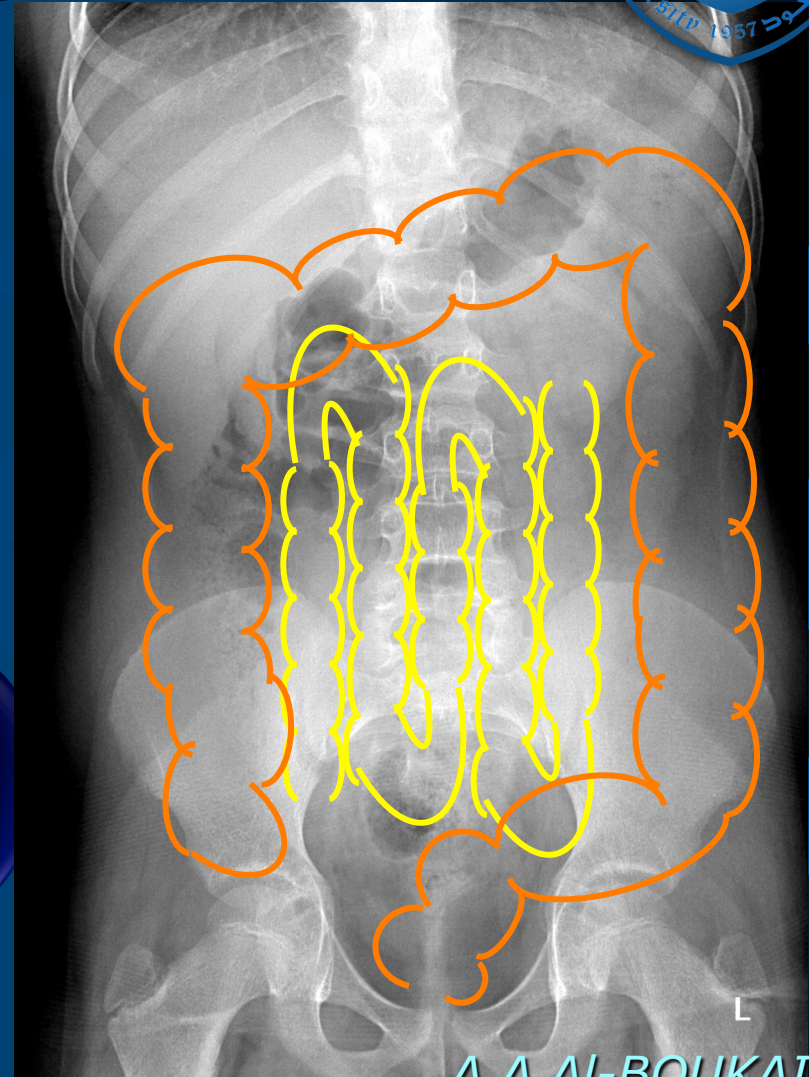
### Normal gas pattern

#### Small bowel

- Central
- Valvulae markings extend across lumen
- Maximum dilated diameter is 3 cm

#### Large bowel

- Peripheral
- Haustral markings
- Contain feces



A A AI-BOUKAI







# IMAGING MODALITIES

## PLAIN FILM - NORMAL

Bowel mucosal folds



Haustral pattern in large bowel



Valvulae conniventes in small bowel



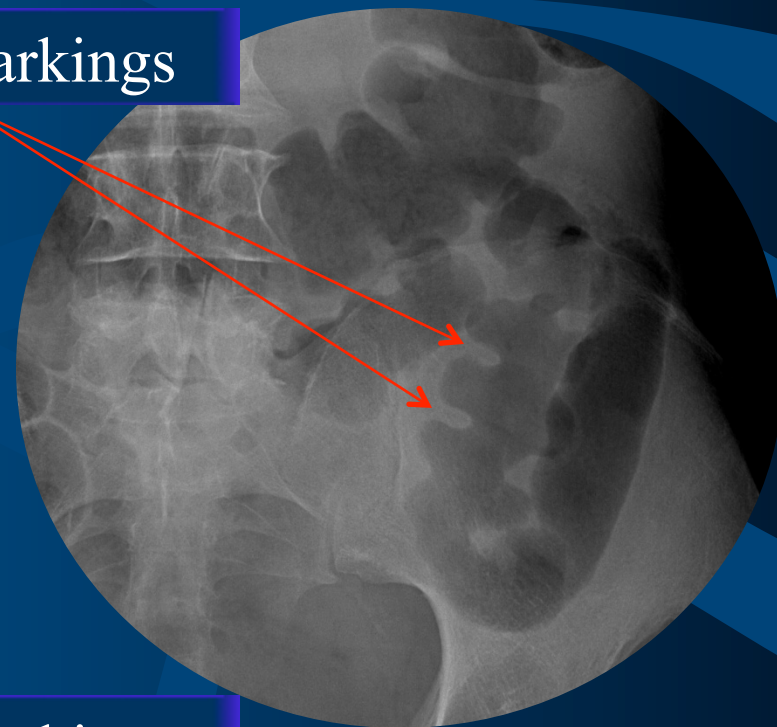
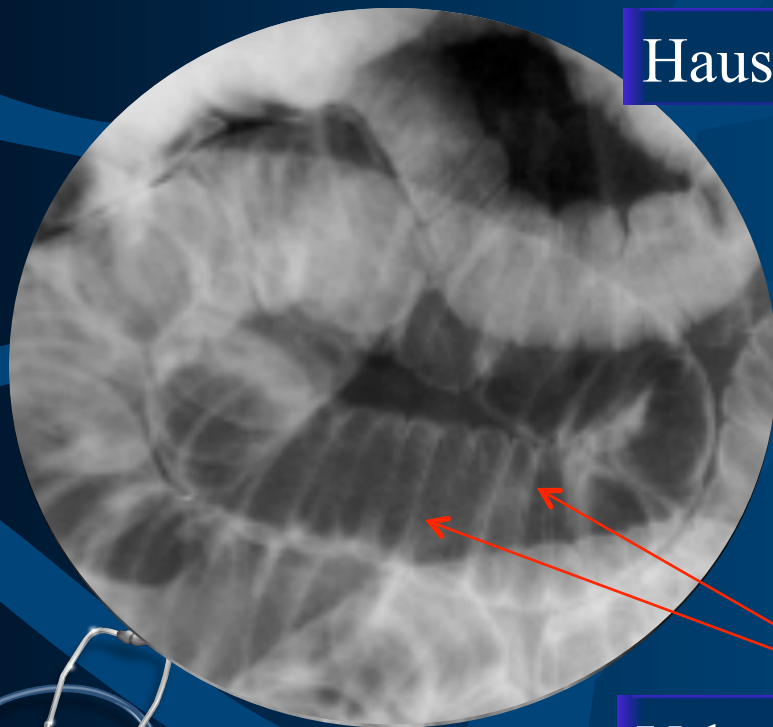
# IMAGING MODALITIES

## PLAIN FILM - NORMAL

Bowel mucosal folds

Haustral markings

Valvulae markings







# IMAGING MODALITIES

## PLAIN FILM - NORMAL

### Gas Bowel



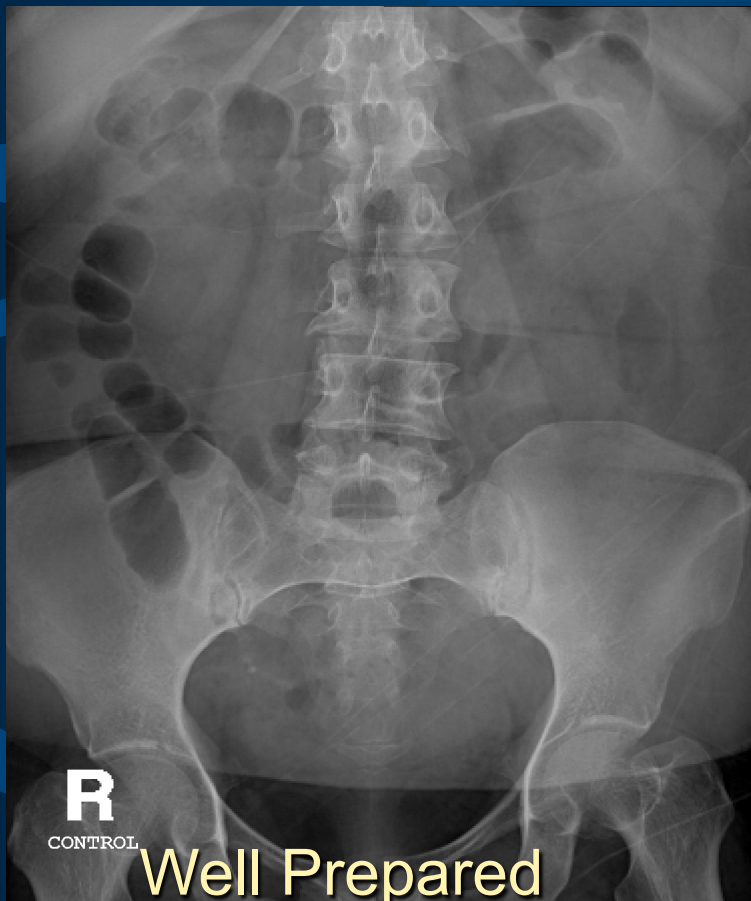
A A AI-BOUKAI





# IMAGING MODALITIES

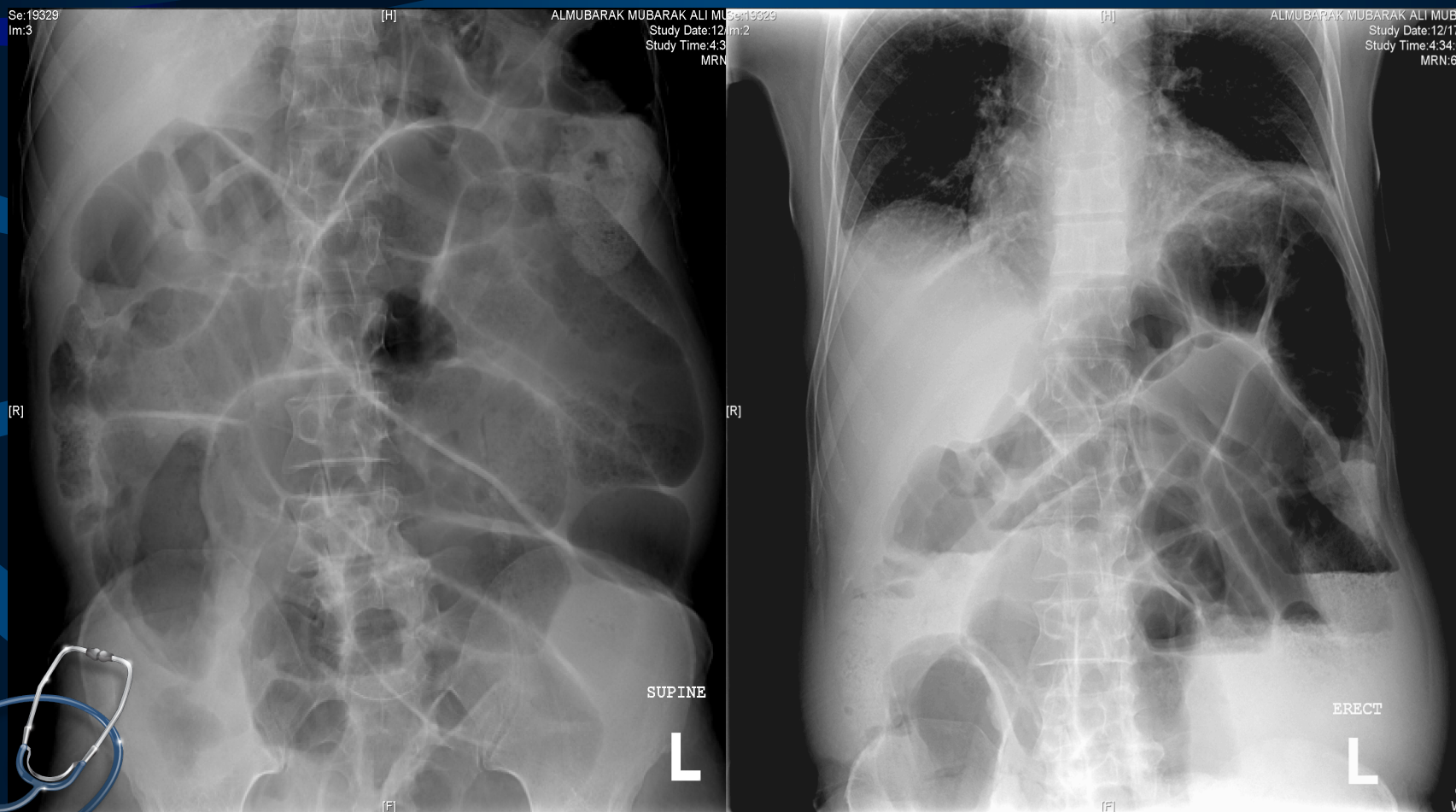
## PLAIN FILM – NORMAL / Bowel Preparation





# IMAGING MODALITIES

## PLAIN FILM – ABNORMAL





# **IMAGING MODALITIES**

*Imaging modalities utilized in evaluation of Gastrointestinal Tract:*

## **FLUROSCOPY – Dynamic Contrast Studies**

Natural contrast in the body

- Air
- Fat

Added contrast in the body

- Barium sulfate
- Iodine (Water Soluble)





# IMAGING MODALITIES

*Imaging modalities utilized in evaluation of Gastrointestinal Tract:*

## FLUROSCOPY – Dynamic Contrast Studies

- Barium sulfate



- Iodine (Water Soluble)



BOUKAI

A A AI-BOUKAI



# IMAGING MODALITIES

## FLUROSCOPY – Barium Swallow



### Ba Swallow Indications:

- Dysphagia
- Pain
- Tracheo-esophageal Fistula
- Esophageal perforation
- Pre-operative assessment of bronchial Ca





# IMAGING MODALITIES

## FLUROSCOPY – Barium Meal

### Indications:

- Dysphagia
- Weight Loss
- Upper Abdominal Mass
- Assessment of site of Perforation
- Pre-operative assessment of bronchial Ca



### Contra-indications:

- Complete Large Bowel Obstruction

### Patient Preparation:

- Nil orally for 6 hours prior to exam
- Stop Smoking

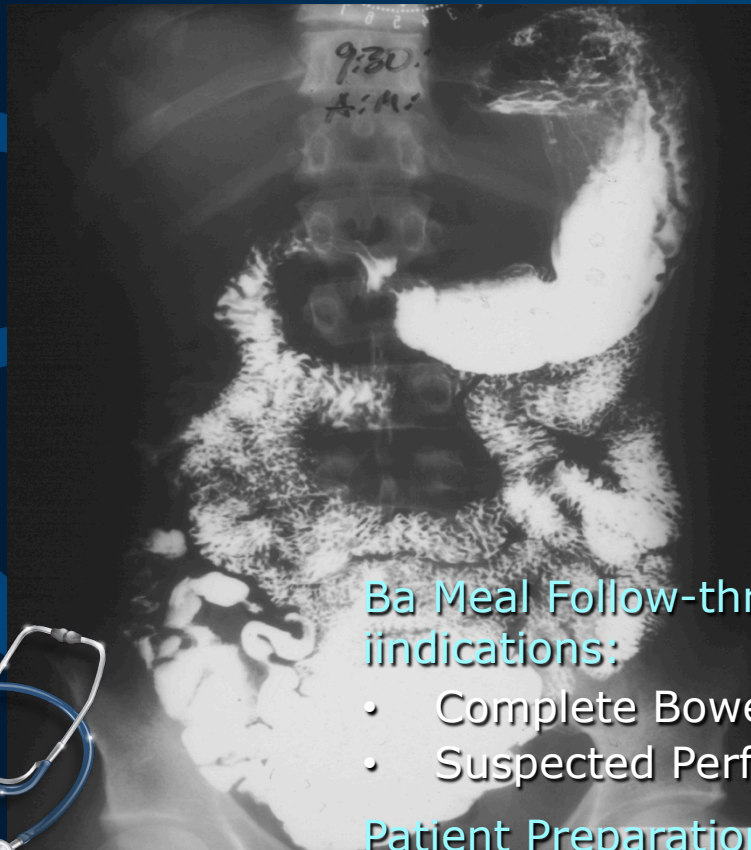


# IMAGING MODALITIES

## FLUROSCOPY

Barium Meal Follow-through

Small Bowel enema

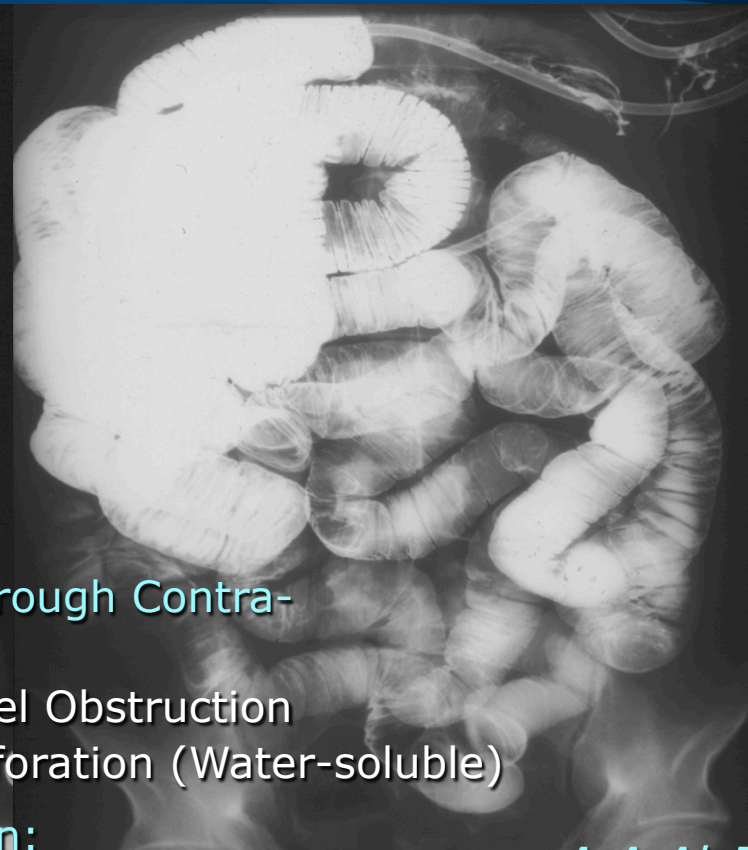


Ba Meal Follow-through Contra-  
indications:

- Complete Bowel Obstruction
- Suspected Perforation (Water-soluble)

Patient Preparation:

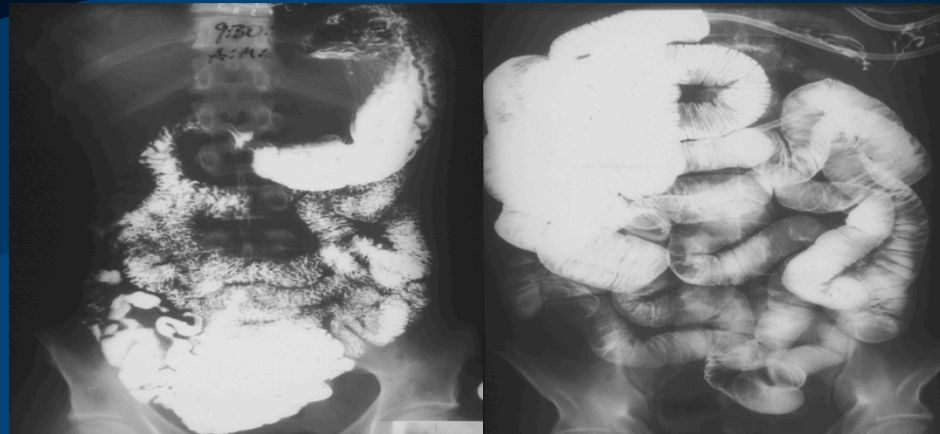
- Laxative





# IMAGING MODALITIES

## FLUROSCOPY



### Ba Meal Follow-through Indications:

- Pain
- Diarrhea
- Bleeding
- Partial Obstruction



### Ba Meal Follow-through Contra-indications:

- Complete Bowel Obstruction
- Suspected Perforation (Water-soluble)

### Patient Preparation:

- Laxative





# IMAGING MODALITIES

## FLUROSCOPY – Barium Enema

### Ba Enema Indications:

- Pain
- Change in bowel habit
- Bleeding / Melaena
- Obstruction



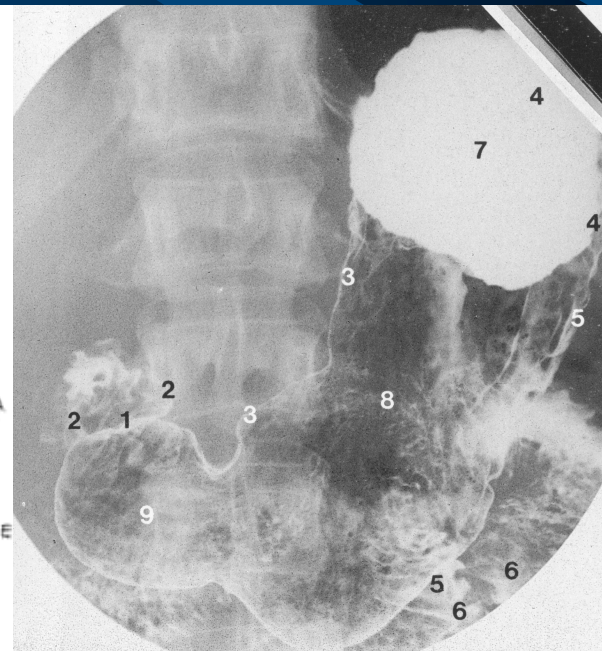
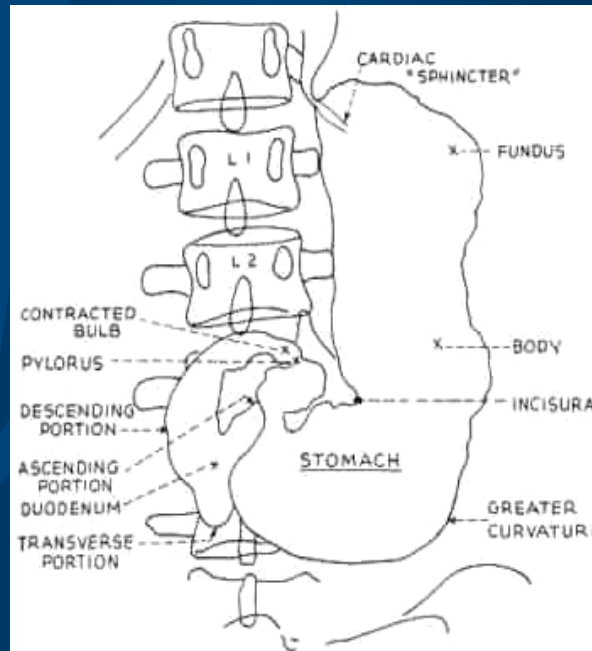


# IMAGING MODALITIES

## FLUROSCOPY – Dynamic Contrast Studies

Anatomy:

- 1- Pylorus
- 2- Duodenal cap "1st part of duodenum"
- 3- Lesser curvature of stomach
- 4- Barium in the fundus of stomach
- 5- Greater curvature of stomach
- 6- Jujenal loops
- 7- Fundus of Stomach
- 8- Body of stomach
- 9- Antrum of stomach



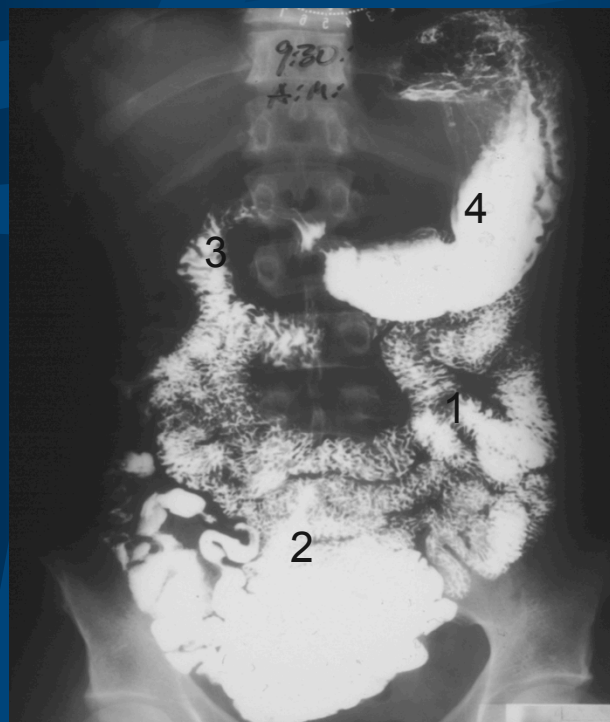
# IMAGING MODALITIES

## FLUROSCOPY

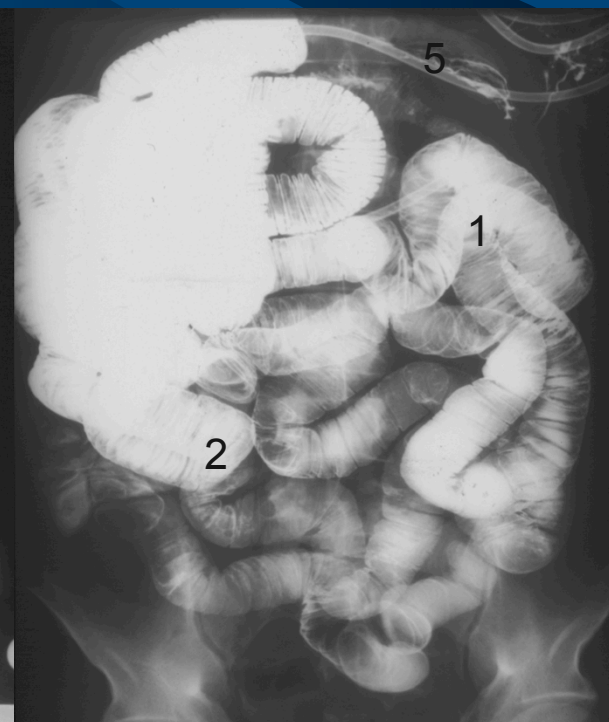
Anatomy:

- 1- Jujenal loops
- 2- Ileal loops
- 3- Duodenal loop
- 4- Stomach
- 5- Nasogastric tube

Barium Meal Follow-through

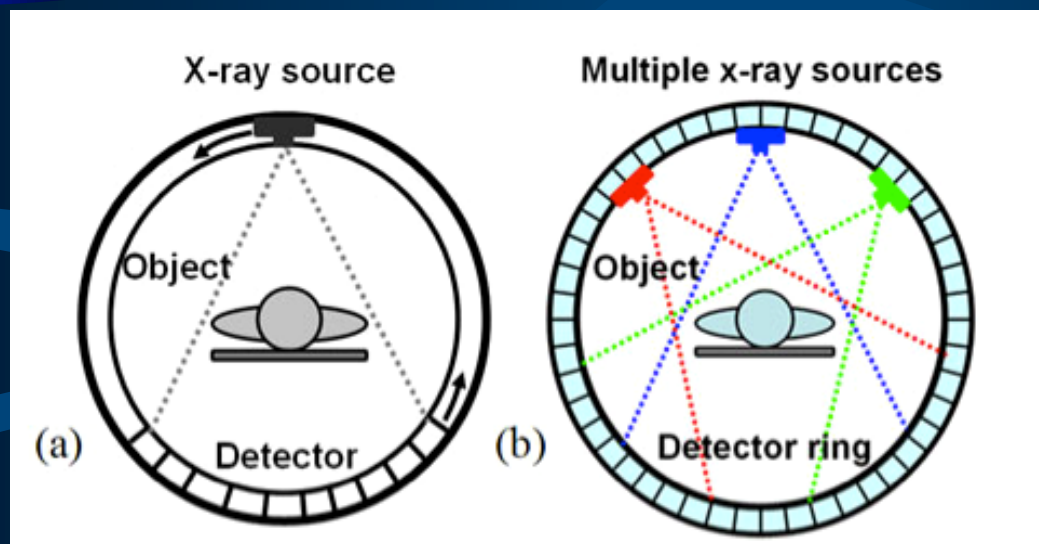


Small Bowel enema



# IMAGING MODALITIES

## COMPUTED TOMOGRAPHY



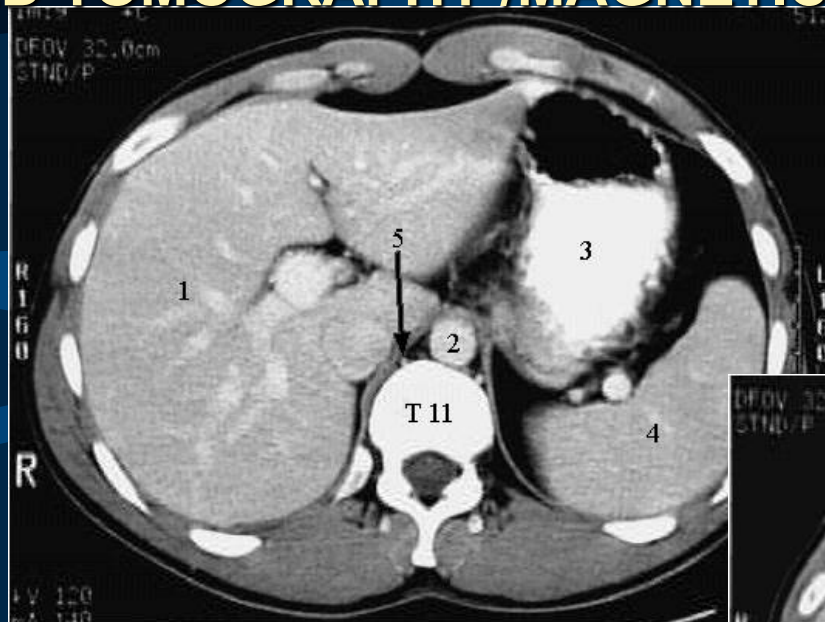


# IMAGING MODALITIES

## COMPUTED TOMOGRAPHY /MAGNETIC RESONANCE IMAGING

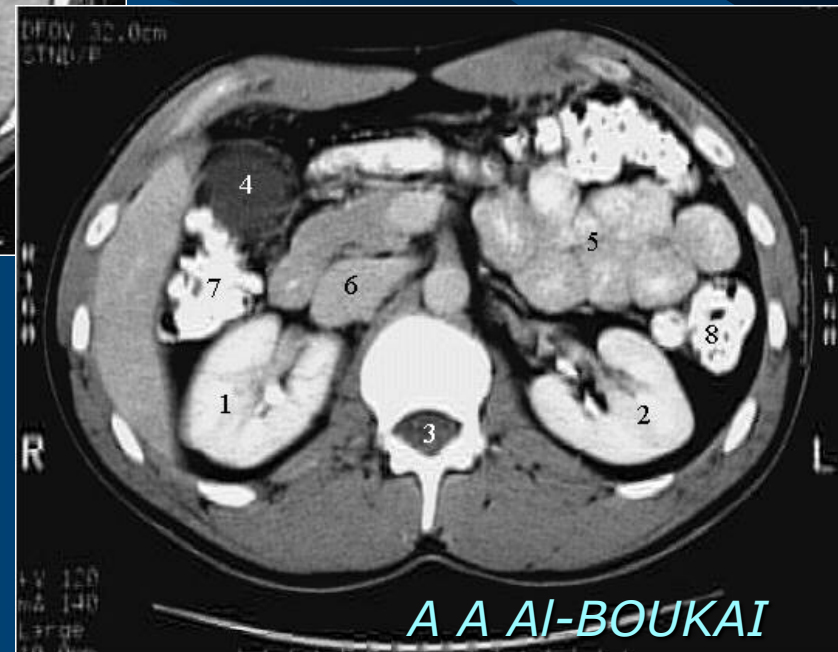
### Anatomy:

- 1- Liver
- 2- Aorta
- 3- Stomach
- 4- Spleen



### Anatomy:

- 1- Right Kidney
- 2- Left Kidney
- 3- Spinal Canal
- 4- Gall Bladder
- 5- Jejunal loops
- 6- IVC
- 7- Right Colon
- 8- Left Colon

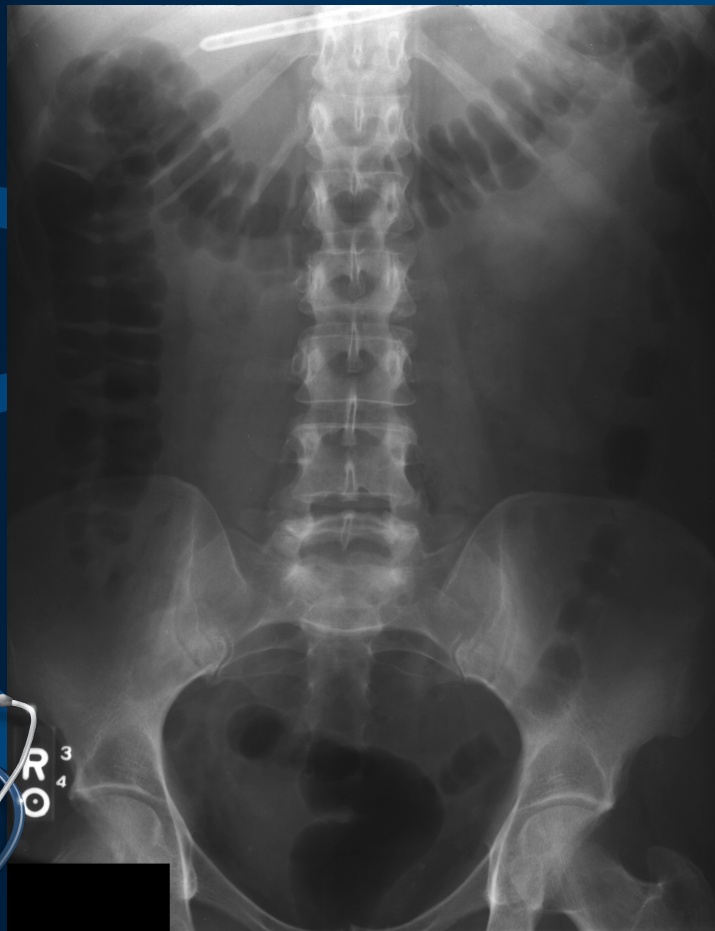


A A AL-BOUKAI



# IMAGING MODALITIES

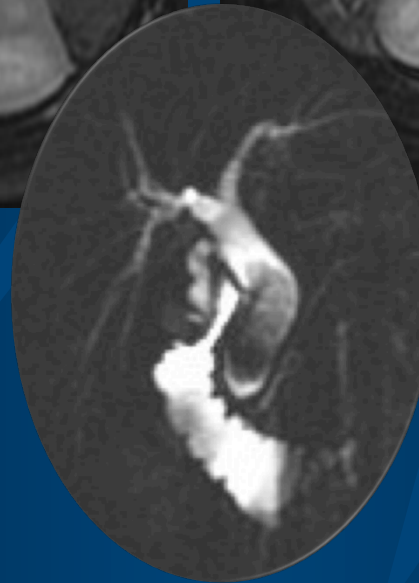
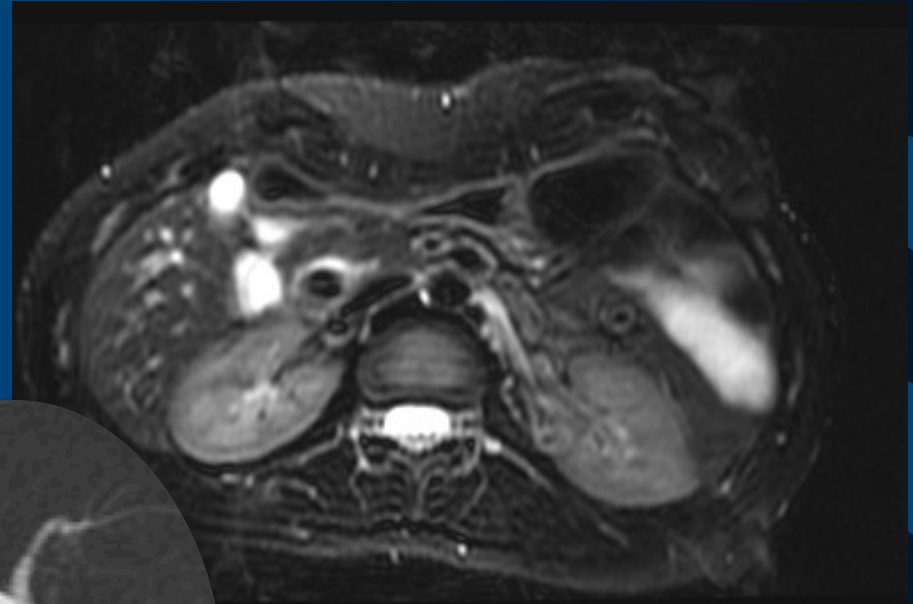
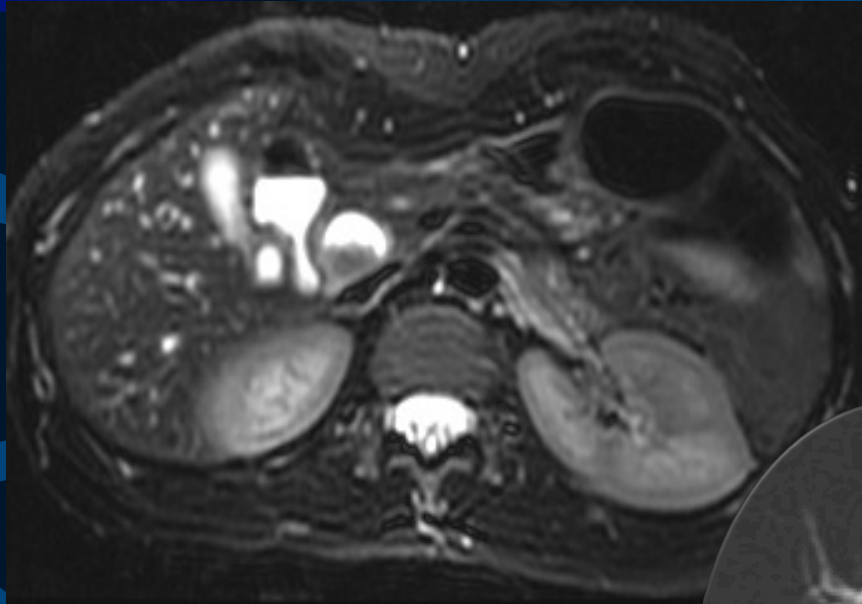
## COMPUTED TOMOGRAPHY





# IMAGING MODALITIES

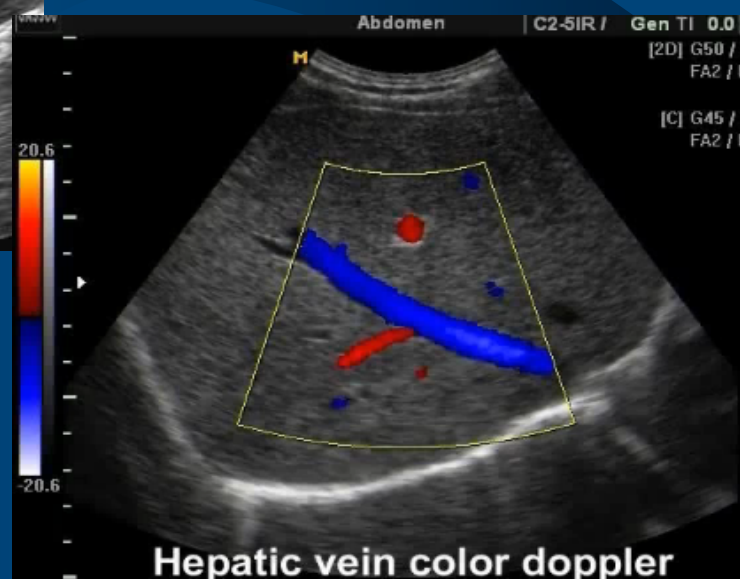
## MAGNETIC RESONANCE IMAGING





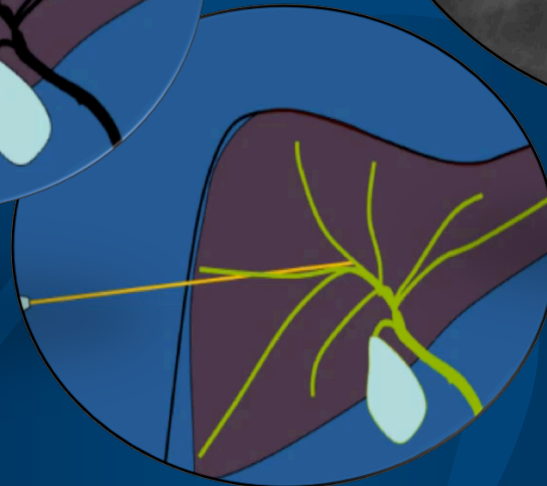
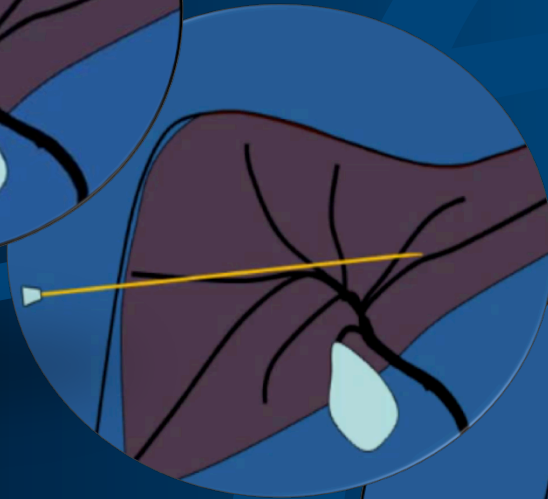
# IMAGING MODALITIES

## ULTRASOUND



# IMAGING MODALITIES

PTC

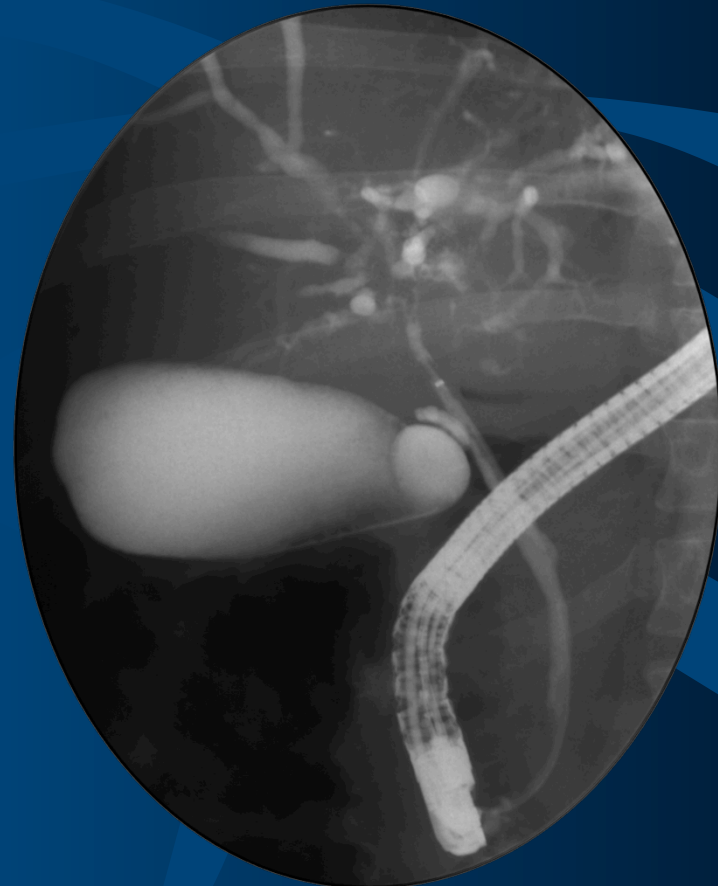
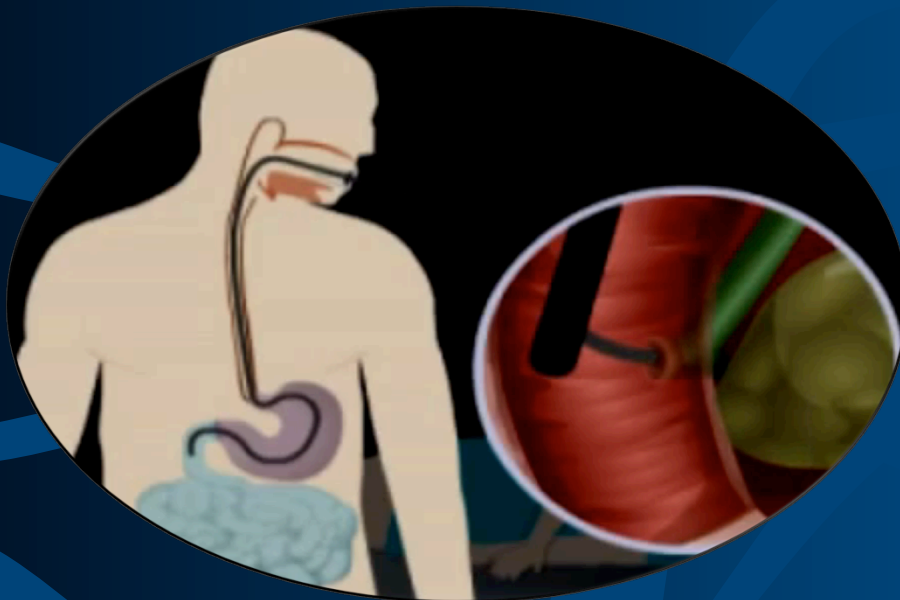






# IMAGING MODALITIES

## ERCP





# IMAGING MODALITIES

## ERCP & PTC





**THANKS**

