

RAD - 361

**RADIOLOGY OF
GASTROINTESTINAL TRACT**

By
Dr. Ahmad Amer Al-Boukai

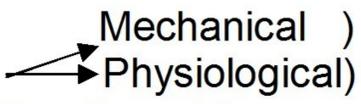
Methods of demonstration and investigating the gastrointestinal tract

- Plain film
- Barium studies:
 - Barium swallow
 - Barium meal
 - Barium follow-through / Small bowel enema
 - Barium enema
- Nuclear medicine
- Computerized tomography
- Magnetic resonance Imaging
- Angiography
- Ultrasound
- ERCP & PTC

Plain Abdominal Film

- 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.

Findings on plain film:

- Normal
- Bowel gas pattern
 - * Intestinal Obstruction (dilated, air-fluid levels )
More than 3 fluid levels greater than 2.5 cm in length and in dilated small bowel (> 2.5 cm in diameter) are abnormal.
 - * Normal maximum diameter of small bowel is 2.5 cm, of large bowel is 5 cm; and of cecum is 9 cm.
 - * Masses: can lead to (displaced, distorted or absent gas bowel shadow)
- Pneumoperitonium
 - * Free air within the abdomen
- Calcifications
 - * Renal, gallbladder calculi /stones
 - * Pancreatic
 - * Mesenteric lymph nodes
 - * Masses / inflammatory (etc, bilharziasis)
- Soft tissue Masses (etc, hepatosplenomegaly)
- Bones (pelvis, vertebral column, ribs)

Contrast studies of the gastrointestinal tract:

- These are the studies that are performed with the utilization of contrast agents.
- The aim of this is to assist visualization of some structures such as outlining the wall of hollow viscous (stomach).
- Contrast agents used - Barium sulphate (suspension)
- Iodine preparations (water soluble)

Esophagus (Barium Swallow)

Indications:

- Dysphagia
- Pain
- Tracheo-esophageal-Fistula (TOF)
- Assessment of Esophageal perforation
- Pre-operative Assessment of Bronchial Carcinoma

Note:

In cases of where esophageal perforation is suspected, Water-soluble contrast is preferred as extraluminal barium is potentially hazardous.

Stomach and Duodenum (Barium Meal)

Methods:

- Double contrast (*for mucosal assessment*)
- Single contrast
 - * Children
 - * Very ill adults (*for gross pathology*)

Indications:

- Dysphagia
- Weight loss
- Upper abdominal mass
- Gastrointestinal hemorrhage
- Assessment of site of perforation
- Partial bowel obstruction

Contraindications:

- Complete large bowel obstruction

Patient preparation:

- Nil orally for 6 hours prior to exam
- Stop smoking on the day of exam

Complications:

- Leakage of barium (*unsuspected perforation*)
- Aspiration
- Barium appendicitis
- Conversion of partial large bowel obstruction to complete one

Small bowel (Barium Meal Follow-through and Small Bowel enema)

Barium Meal Follow-through

Indications:

- Pain
- Diarrhea
- Bleeding
- Partial Obstruction

Complications:

- Leakage of barium (*unsuspected perforation*)
- Aspiration
- Barium appendicitis
- Conversion of partial large bowel obstruction to complete one

Contraindications:

- Complete bowel obstruction
- Suspected perforation (*Water-soluble contrast medium*)

Patient preparation:

- Laxative on the evening prior to the examination

Small Bowel enema

Indications:

Same as above

Advantage:

Peter visualization of *Small Bowel* (*large, rapid, continuous of column CM*)

Disadvantage:

- Intubation's unpleasant
- Difficult
- Time consuming

Complications:

- Perforation (*Manipulation of guide-wire*)
- Aspiration

Large bowel (*Barium Enema*)

Indications:

- Change of bowel habit
- Pain
- Mass
- Melaena
- Obstruction (In pediatric patient with intussusception, the exam is diagnostic and therapeutic).

Contraindications:

- Toxic megacolon
- Pseudomembranous colitis
- Rectal biopsy within the previous 3 days

Patient preparation:

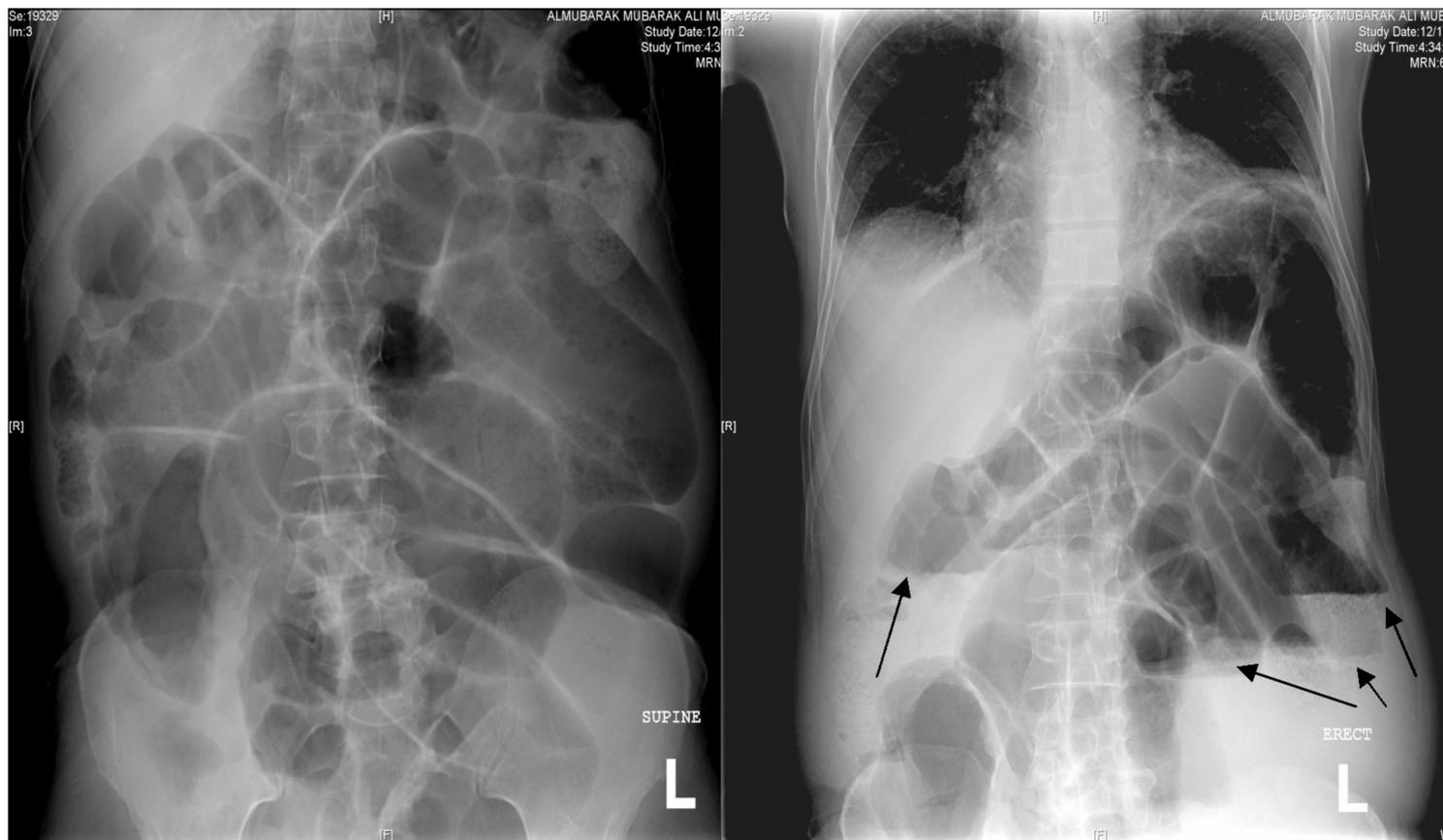
- Lower residue diet (≈ 3 days)
- Laxative

Complications:

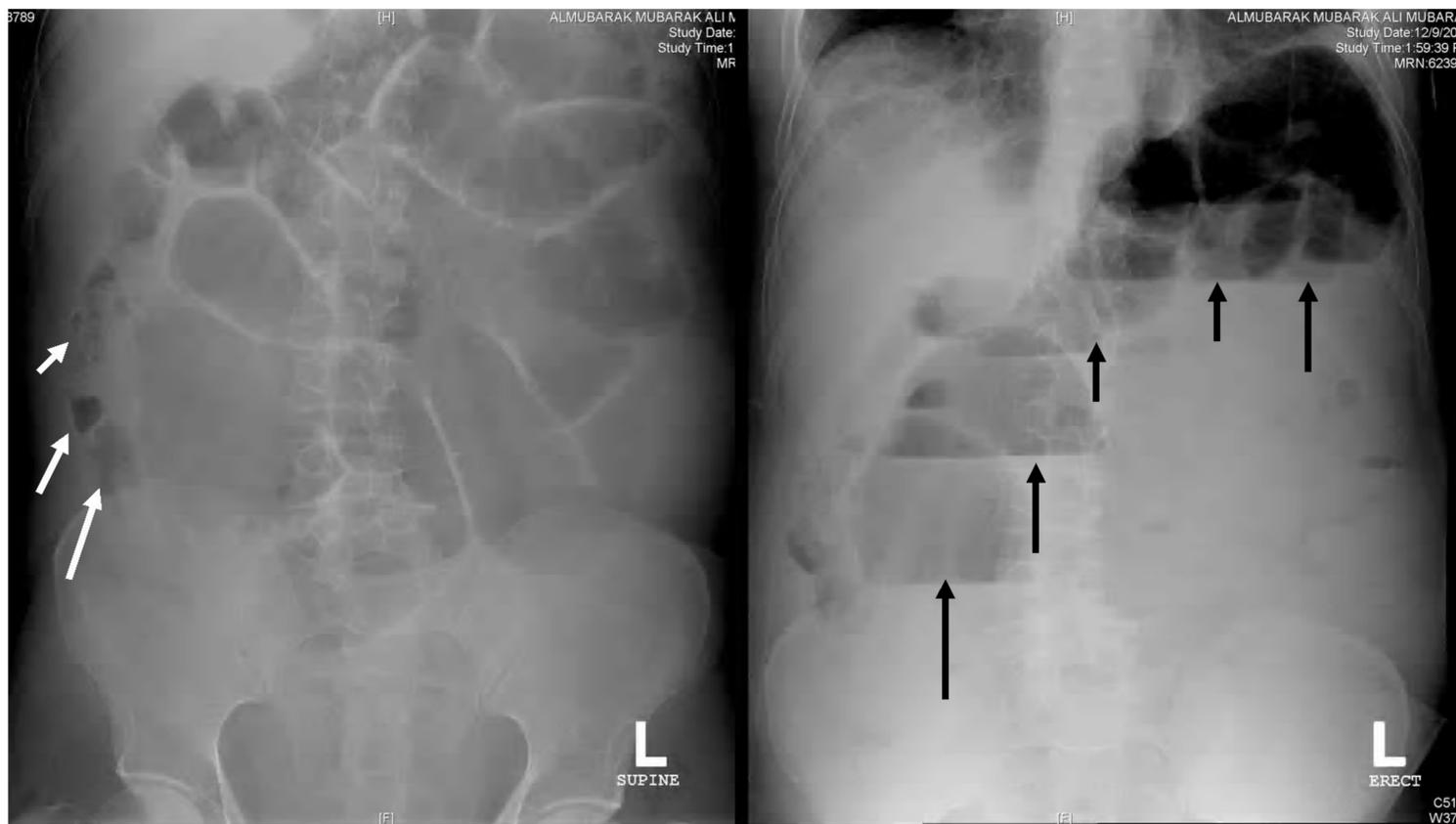
- Perforation
- Venous extravasations
- Water intoxication (*drowsiness & convulsions*)
- Cardiac arrhythmias (*rectal distension*)
- Transient bacteremia

Examples:

Case No.1 Two different patients with acute abdominal distension



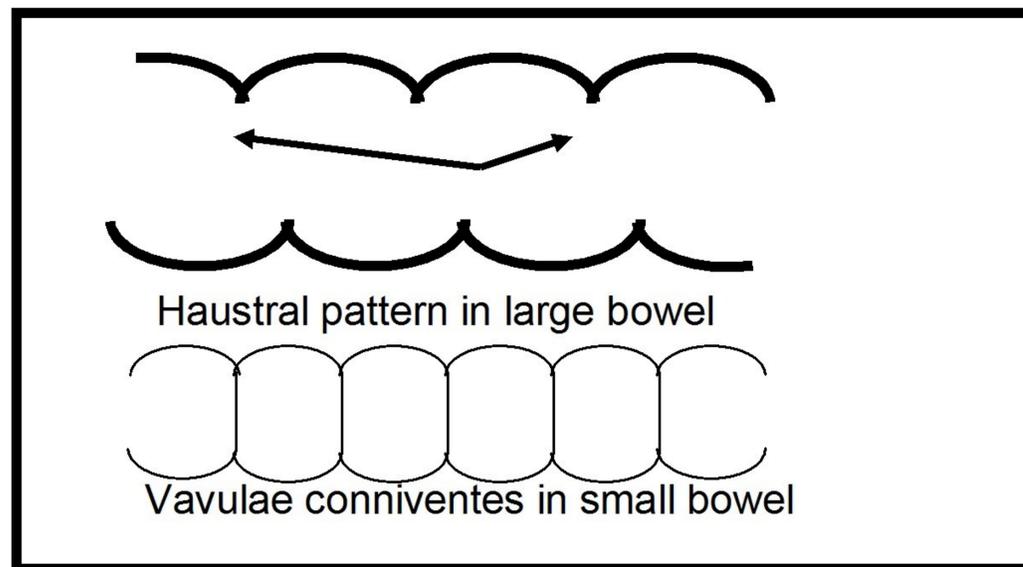
A: Intestinal Obstruction (? Mechanical / Physiological)



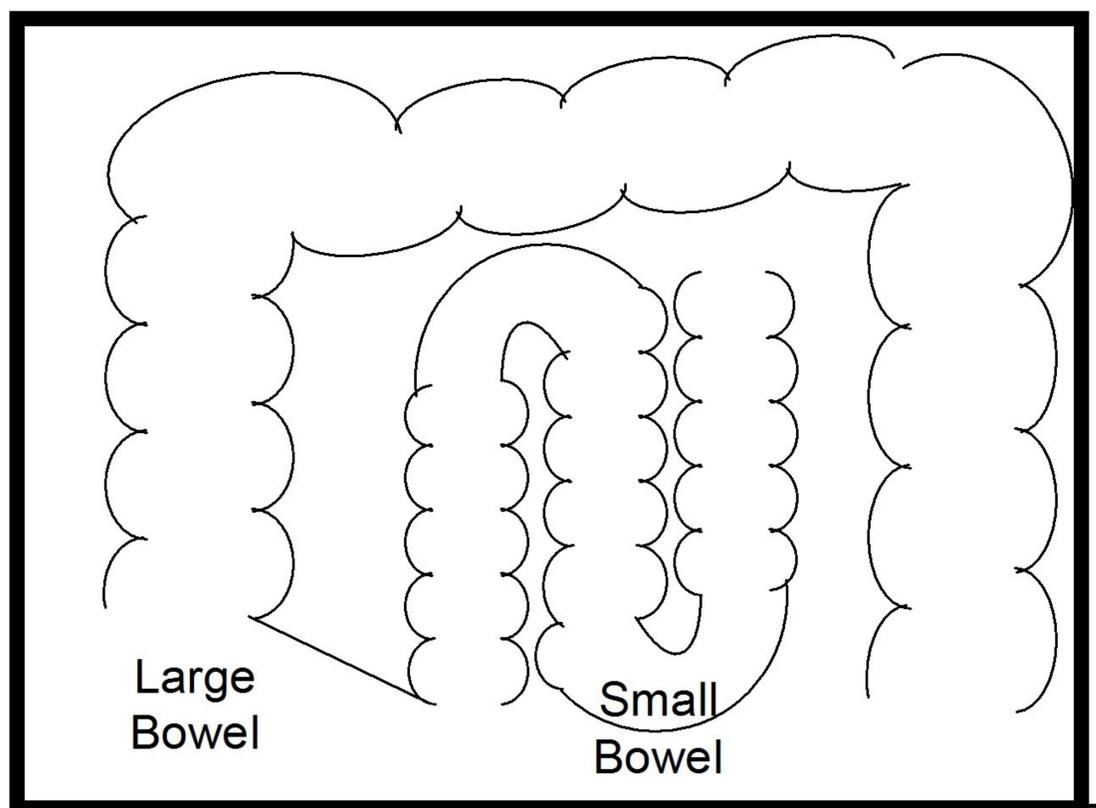
B: Intestinal Obstruction (? Mechanical / Physiological)

Intestinal Obstruction

Bowel mucosal folds



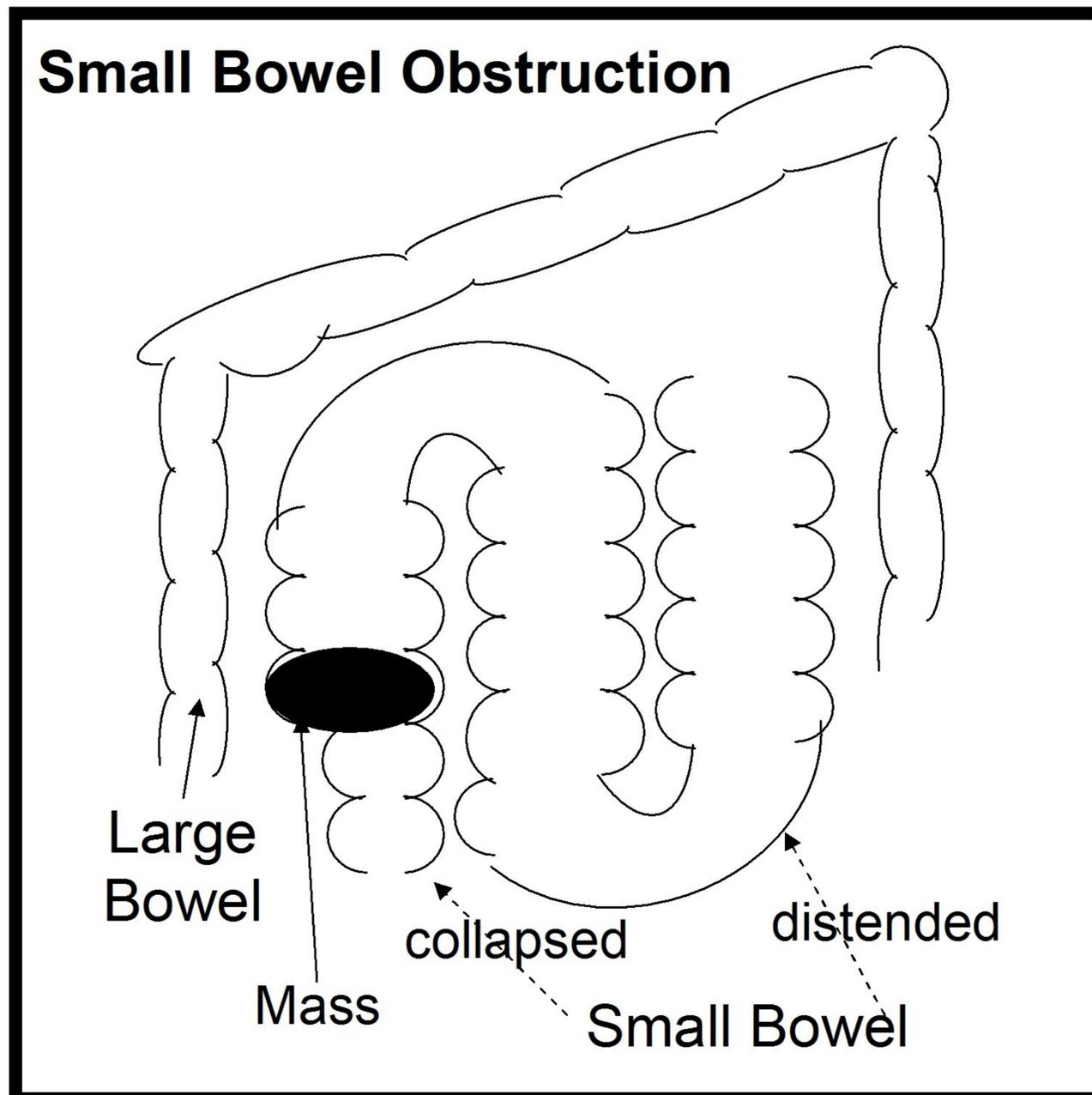
Normal



Answers:

Example A: Mechanical large bowel obstruction.

Example B: Mechanical small bowel obstruction.

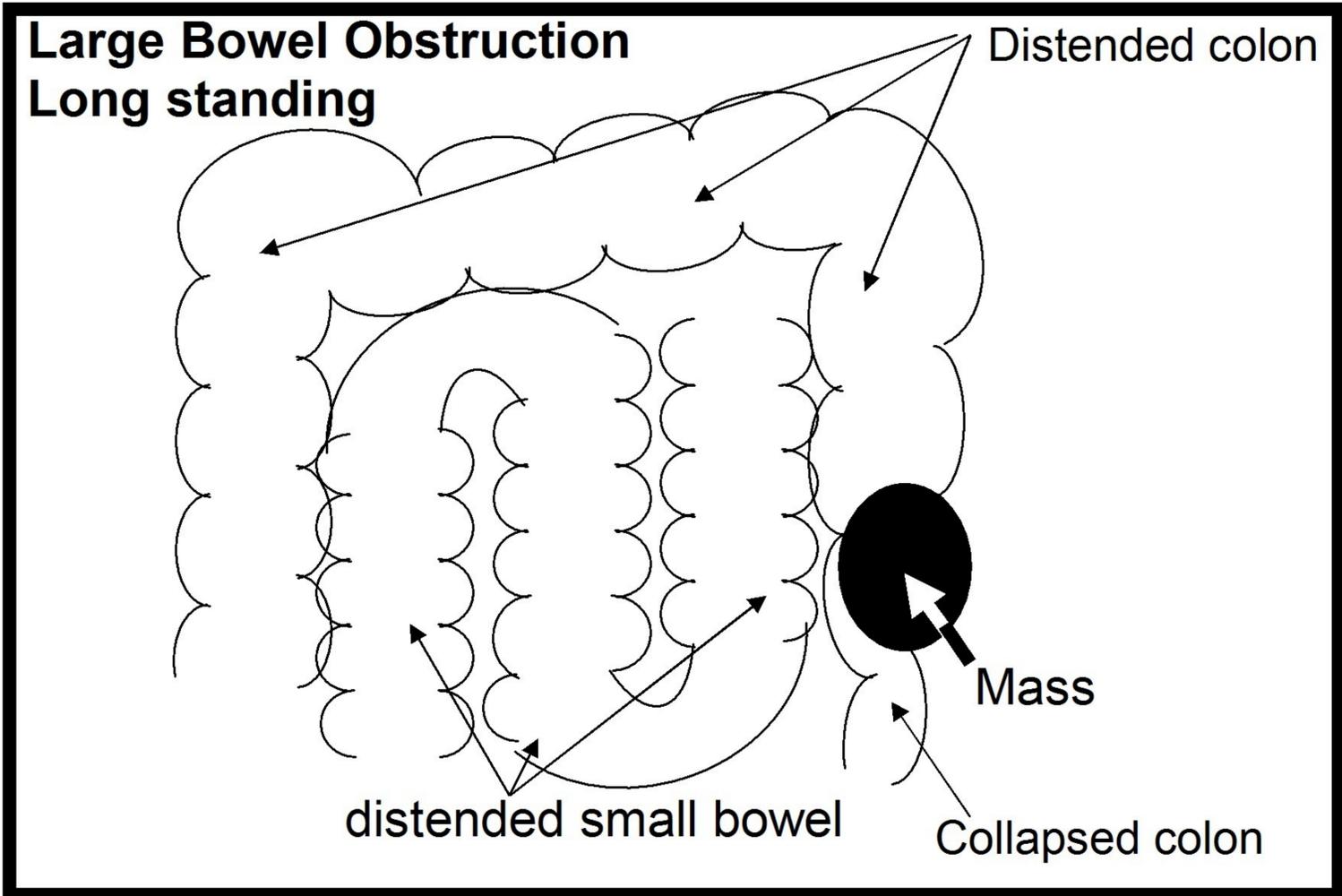
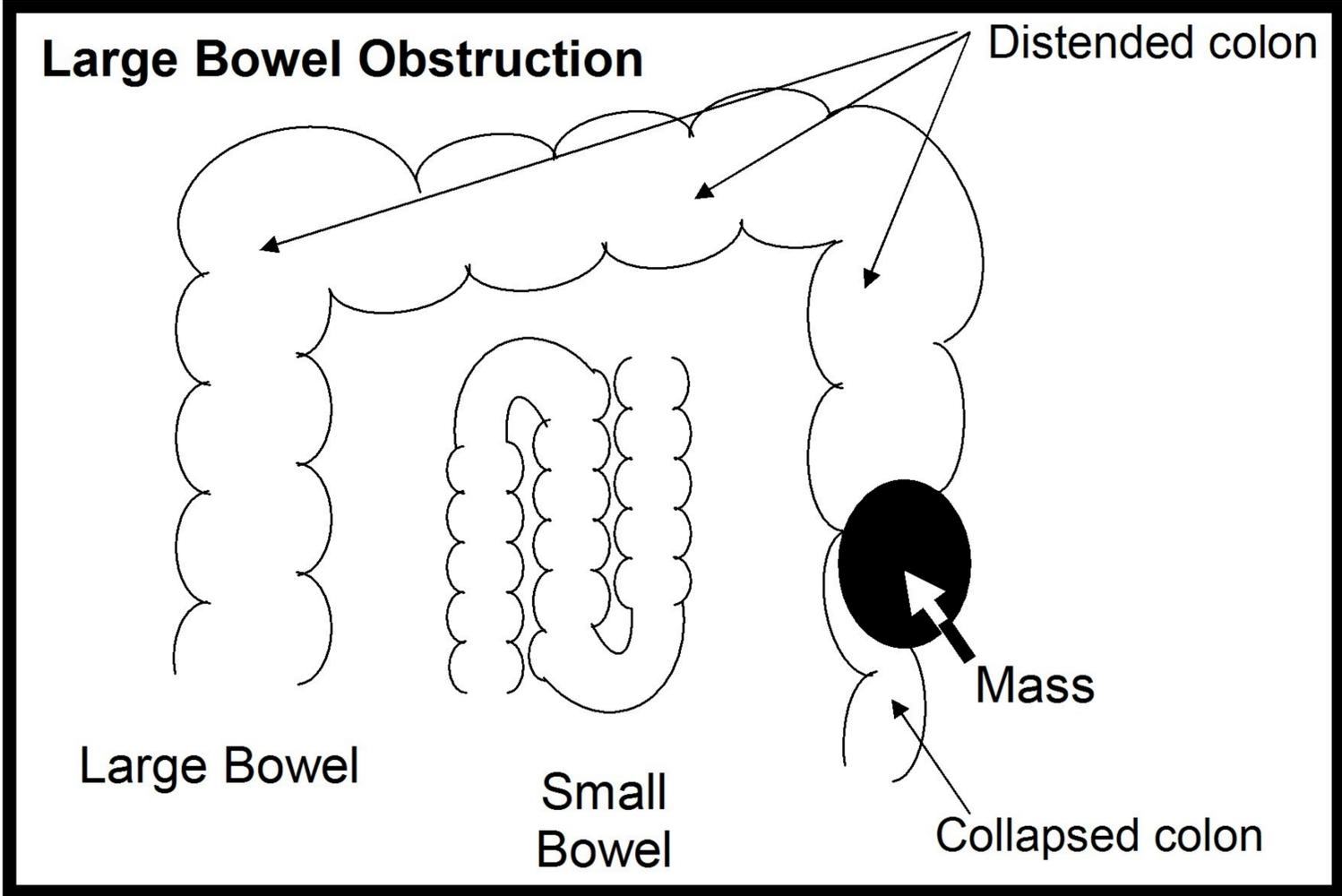


Small bowel obstruction:

- Centrally located dilated loops (> 3 cm diameter).
- Transverse stripes of valvulae conniventes (mucosal folds).
- Multiple air-fluid levels (> 3 levels of more than 2.5 cm length) at different heights (levels) "stepladder" appearance.
- Absence of large bowel distention.

Note:

- Multiple air-fluid levels at different heights are more with mechanical obstruction.
- Multiple air-fluid levels at equal heights are more with physiological obstruction (ileus).
- Although these are classic, they are neither sensitive nor specific.



Case No.2 An adult patient with acute abdominal distension



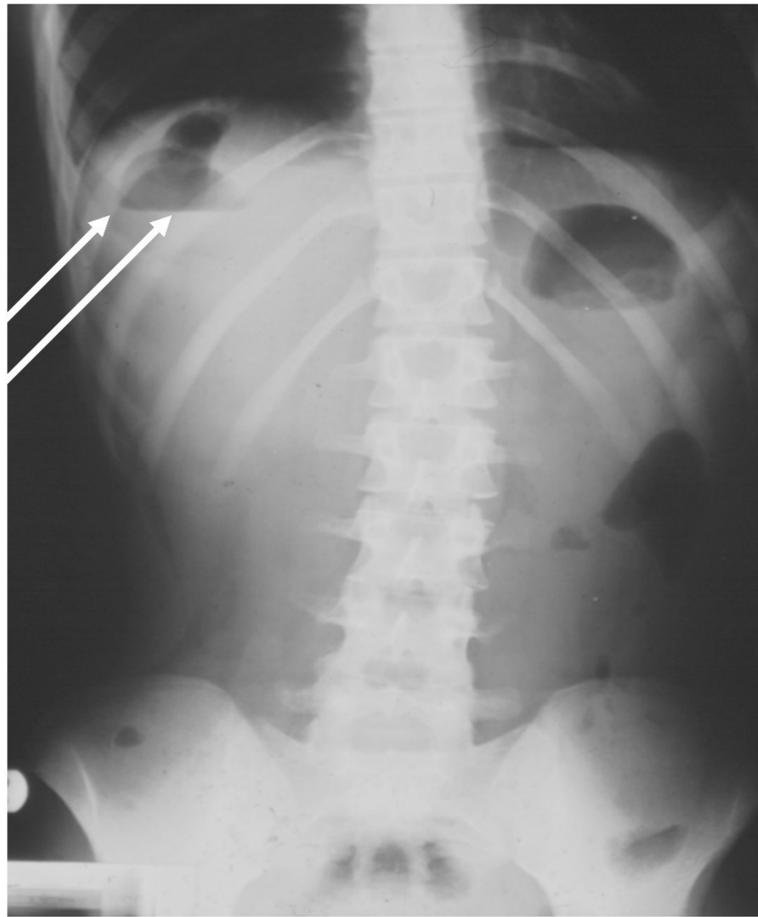
Pneumoperitoneum

- Is the presence of free air within the abdomen.
- The best view to detect pneumoperitoneum is erect chest film.
- It appears as crescentic area of lucency under diaphragm.
- Lateral decubitus can be used for very ill patient. (! Right/ Left)

Causes:

- Peptic ulcer perforation.
- Post laparotomy/ laparoscopy.
- Colonic diverticulum perforation.

Case No.3 An adult patient with acute abdomen and fever



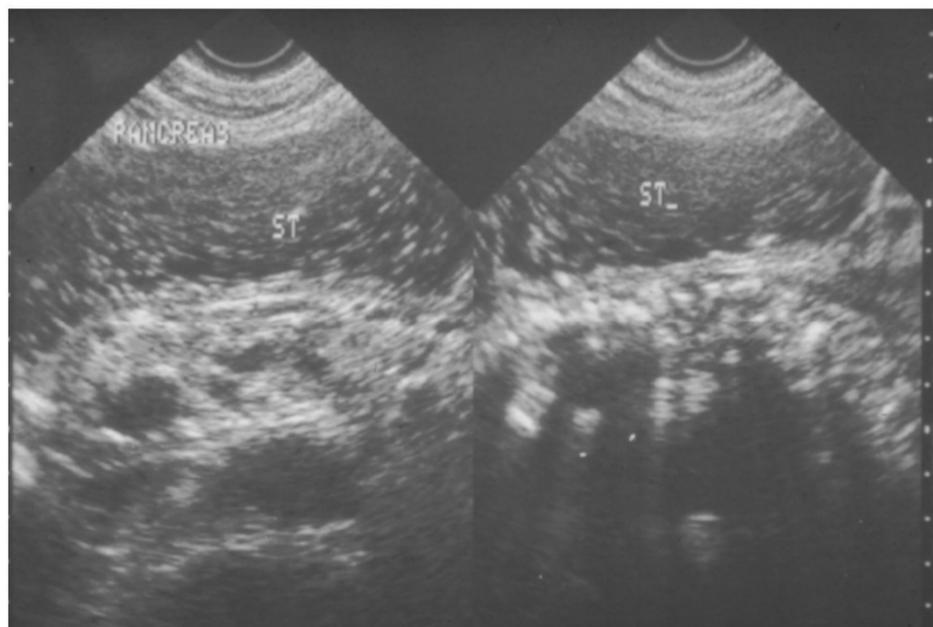
- Here there is abnormal air collection over the right upper quadrant with air-fluid level.
- This suggest presence of loculated subdiaphragmatic collection (abscess formation).

Case No.4 elderly patient with recurrent abdominal pain

A:



B:



This patient shows presence of calcifications, where?
What would be the likely cause of this appearance?

Answer: - Calcifications within the pancreas.
- The likely cause for this is chronic pancreatitis.

Case No.5 patient with recurrent lower abdominal pain and hematuria!



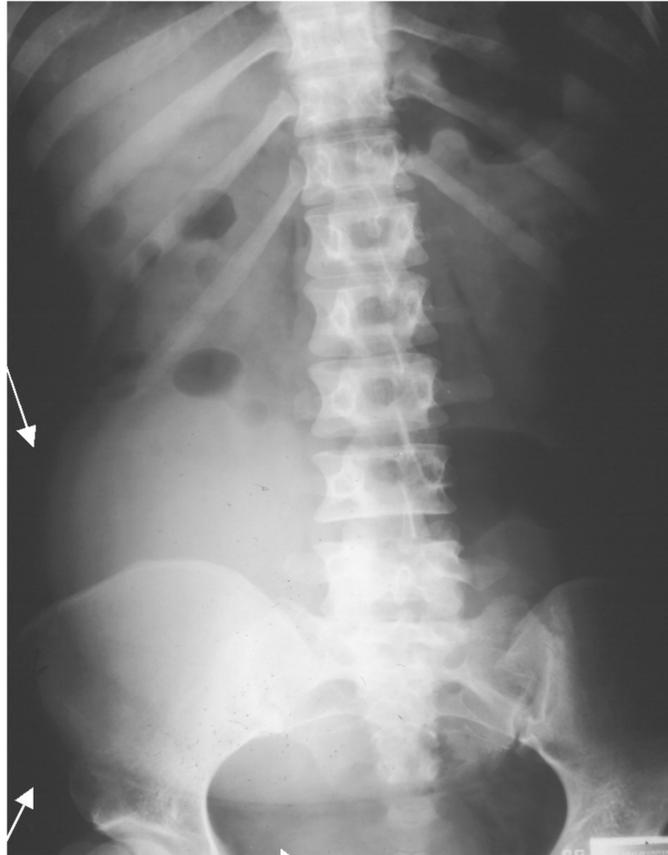
Case No.6 patient with bilateral loin pain



Answers: Case No.5 Urinary bladder calcification due to Bilharziasis.

Case No.6 Renal (left) and Ureteric (right) stones.

Case No.7 Young female patient with abdominal distension



Case No.8 Young male patient with abdominal distension and vomiting

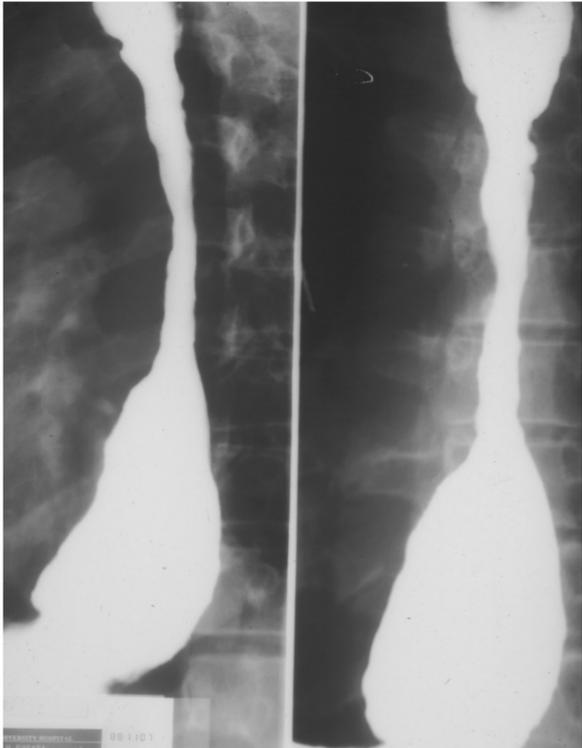


Answers: Case No 7 Soft tissue pelvic mass (Ovarian tumor)

Case No 8 Central Epigastric soft tissue mass (Duodenal obstruction)

Case No.9 Different patients with dysphagia (Benign / Malignant Stricture)

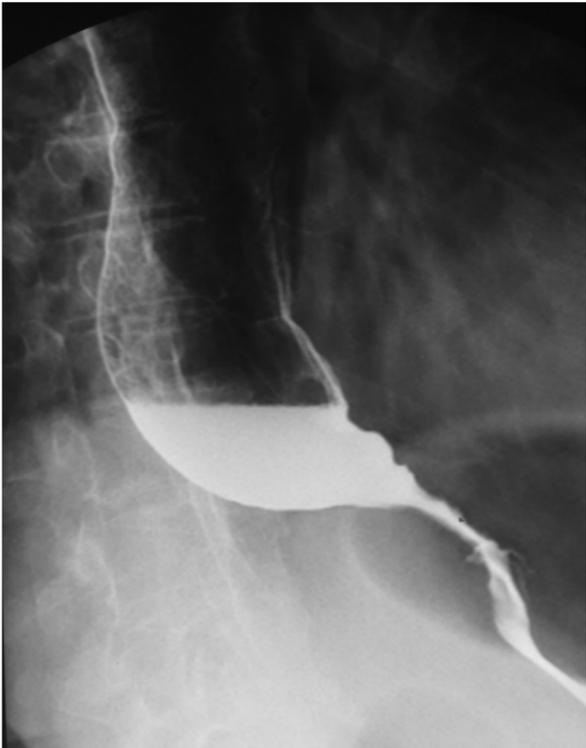
A:



B:



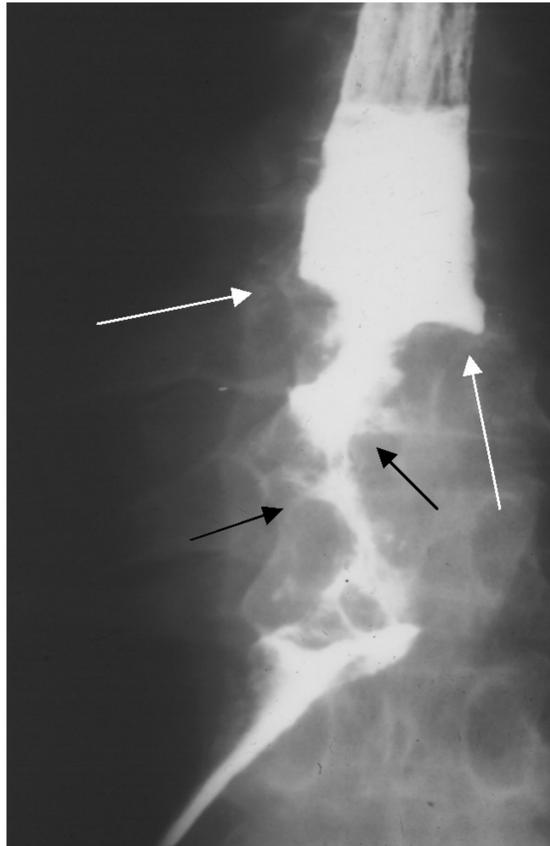
C:



D:



Case No.10 60 years patient with dysphagia



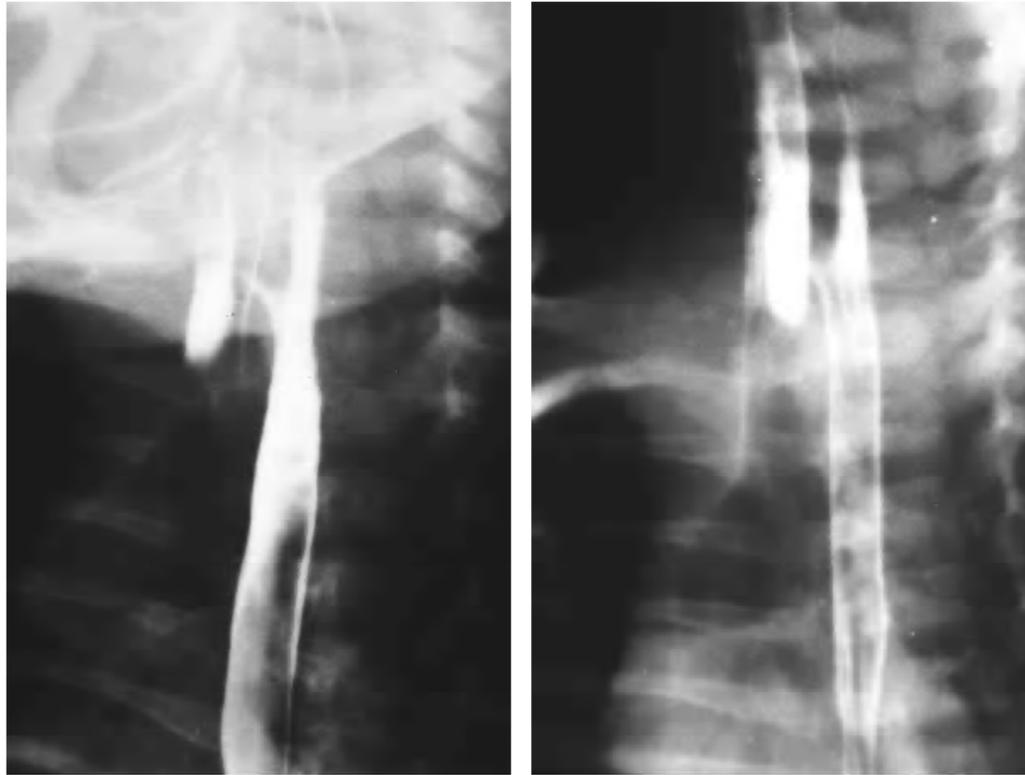
- White arrows indicate presence of shoulder sign
- Black arrows indicate irregular, ulcerated stricture
- This is due to esophageal carcinoma.

Answers:

Case No.9

- A: Benign (Corrosive ingestion)
- B: Benign (Achalasia / motility disorder)
- C: Benign (Achalasia / motility disorder)
- D: Malignant (Esophageal carcinoma)

Case No.11 a child with recurrent chest infection



What is the contrast used here? -Water soluble iodinated contrast. Why?
What does this image show? -Contrast in esophagus and trachea.
-Fistula in between.

What is the other likely cause of such presentation?
- Presence of gastro-esophageal reflux.

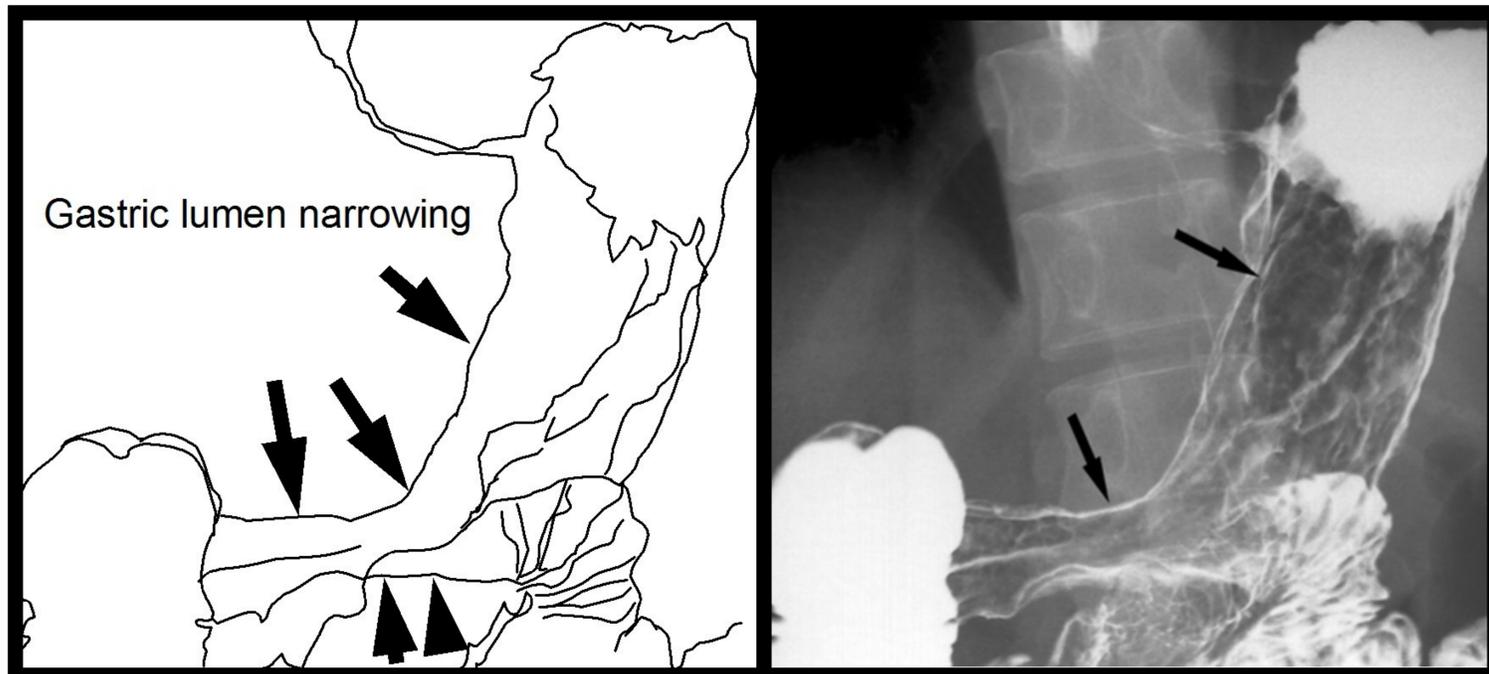
Case No.12 young adult with Epigastric pain



Case No.13 adult with Epigastric pain



Case No.14 adult with vomiting and weight loss

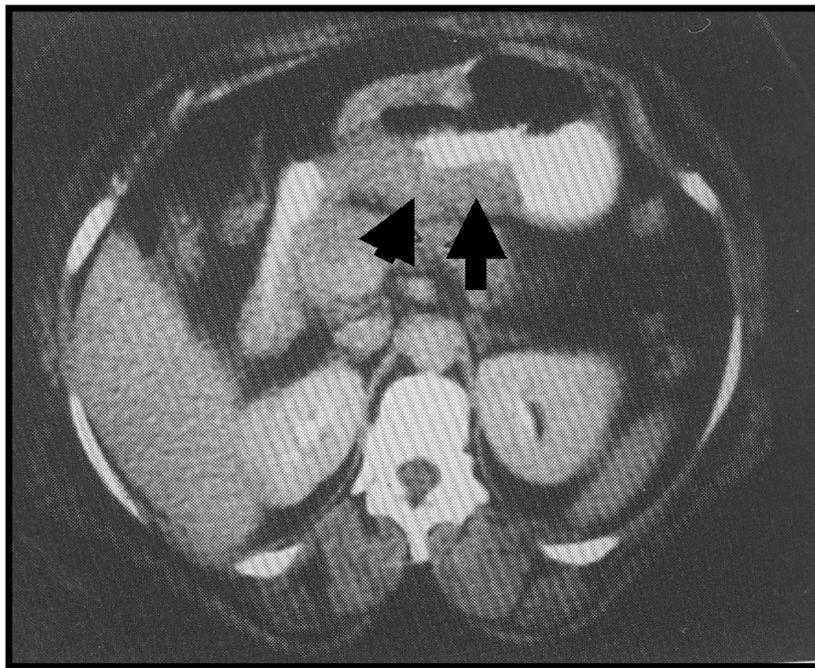


This patient examination demonstrates

- Constant narrowing of the gastric lumen (antrum) giving the appearance of “Linitis plastica” as indicated by the arrows.
- Diffuse infiltration with ulceration of the mucosa and submucosa.

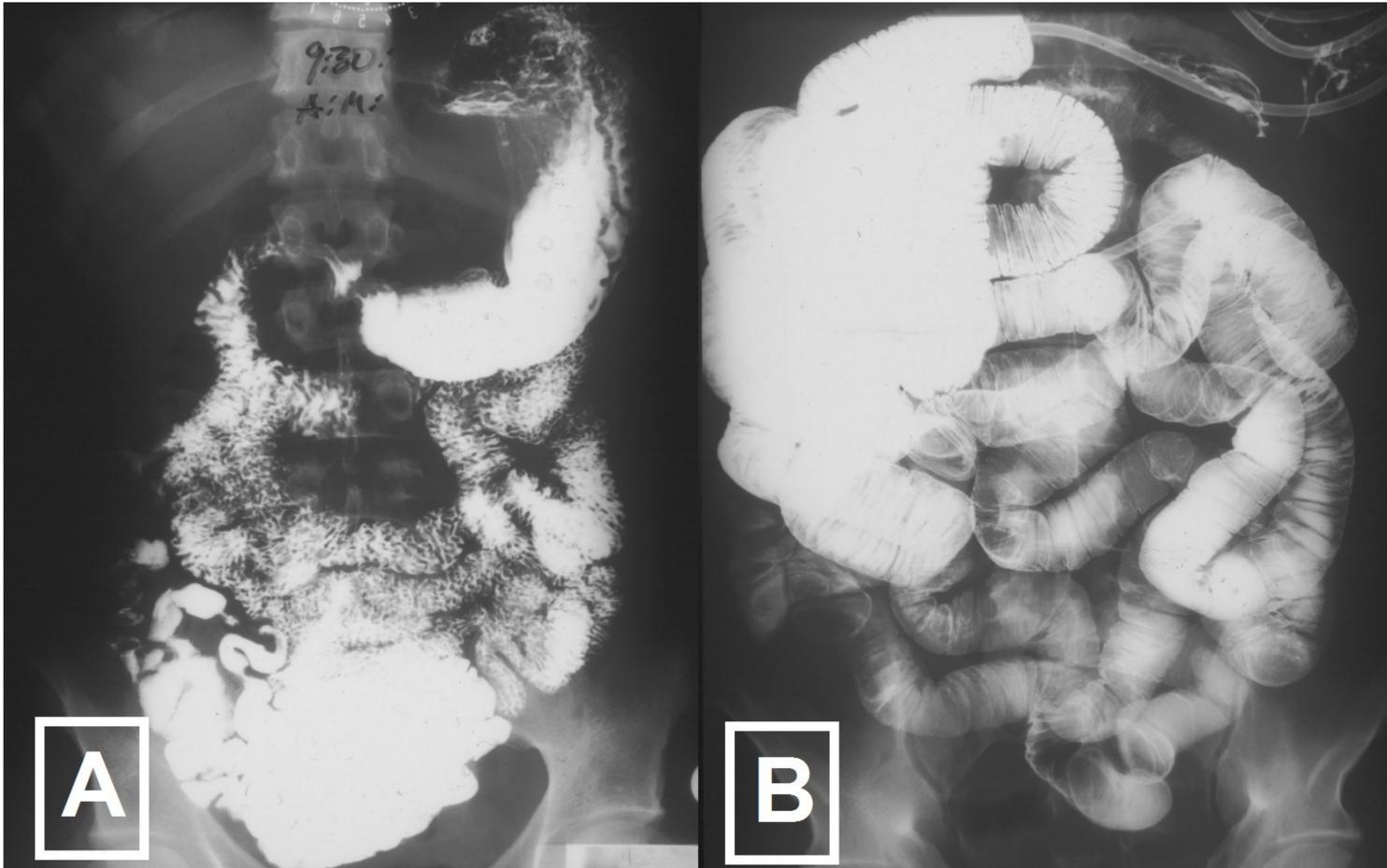
The likely cause of such appearance is gastric carcinoma.

Case No.15 45 year adult patient with vomiting and weight loss

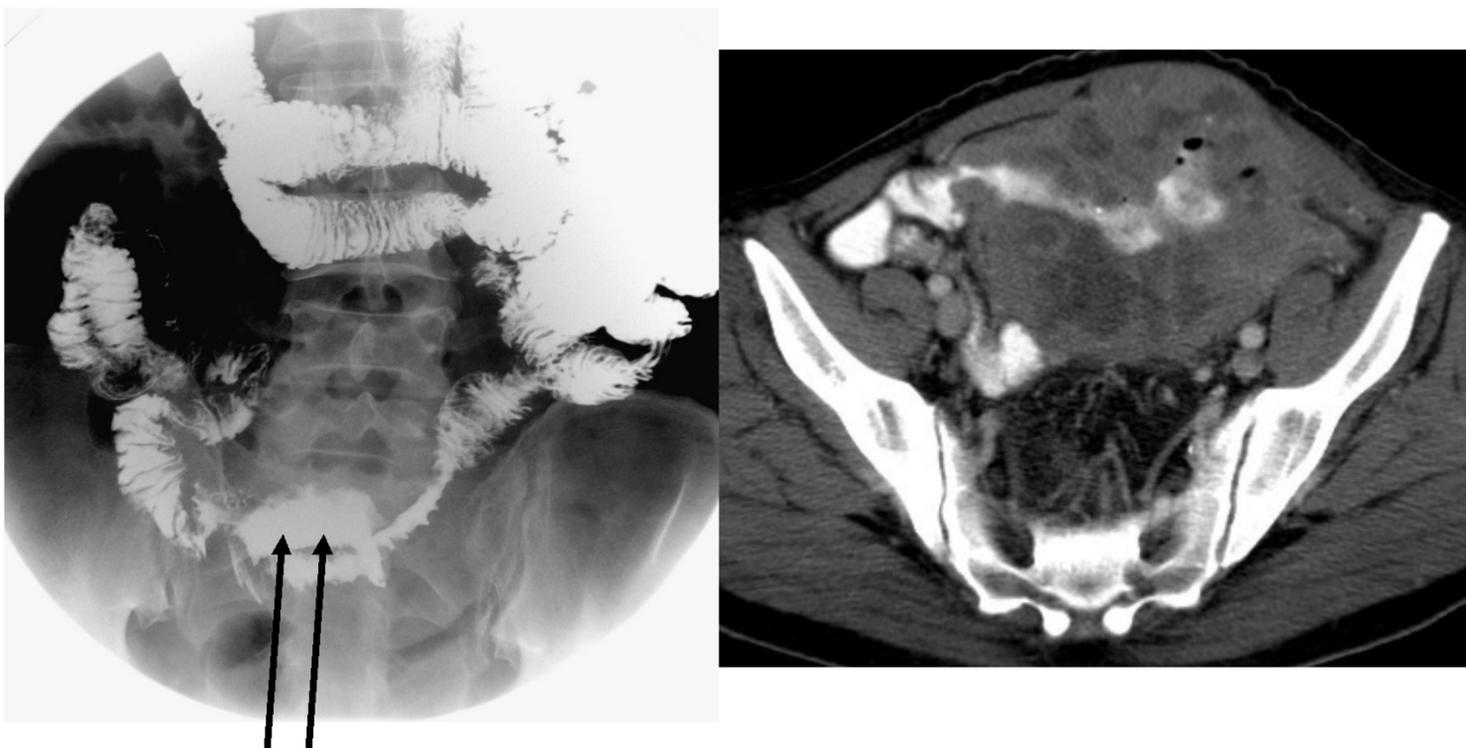


- This is another example of diffuse infiltrating pathology of the gastric wall with thickening and ulceration.
- In this case the cause was gastric lymphoma, which is better delineated by the CT scan of abdomen.
- Note: the large filling defect, lumen narrowing and shouldering deformity.

These are examples of small bowel studies

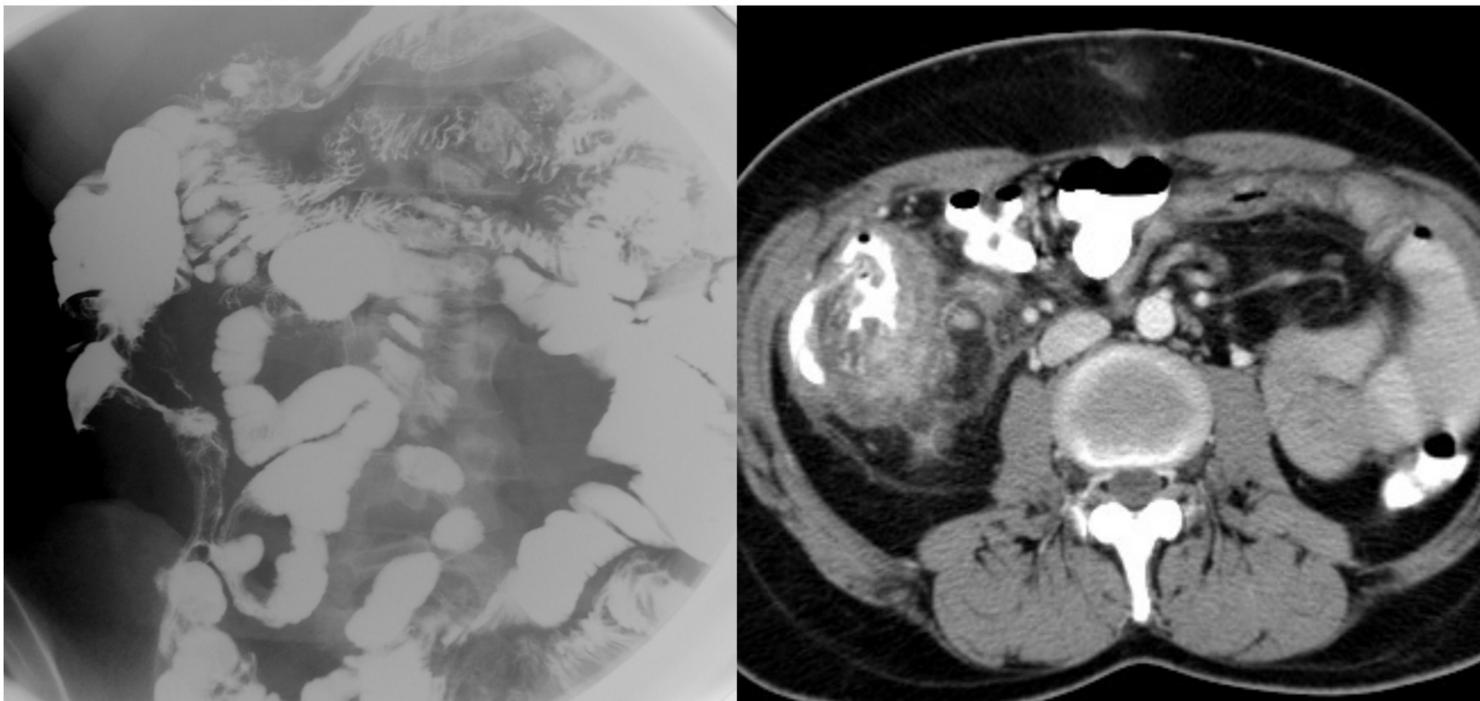


Case No.16 45 year adult patient with vomiting and weight loss



- The previous case is an example of an infiltrating neoplastic lesion involving distal small bowel (ileal loops).
- It shows
 - * Loss of normal mucosal pattern
 - * Narrowing of the lumen
 - * Amorphous collection of barium (arrows)
 - * Bowel loops separation due to wall infiltration, which is best appreciated by CT scan of abdomen

Case No.17 33 year adult female patient with diarrhea and weight loss



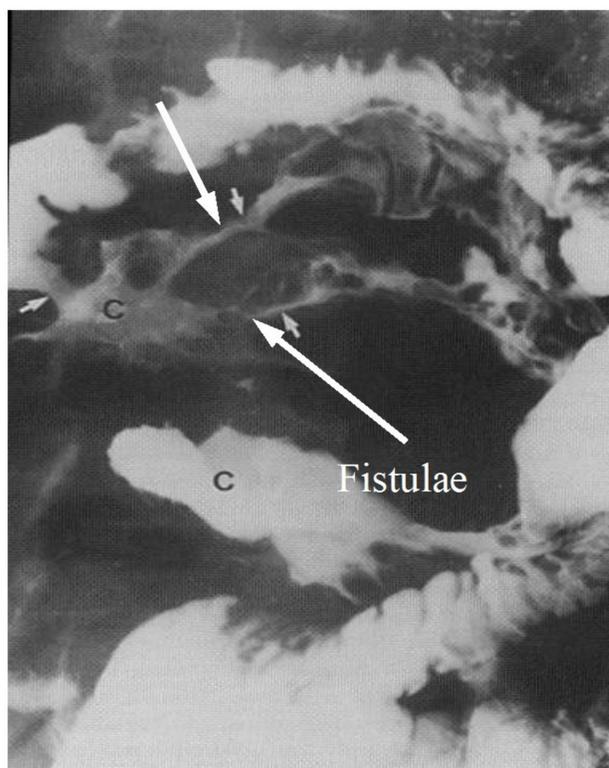
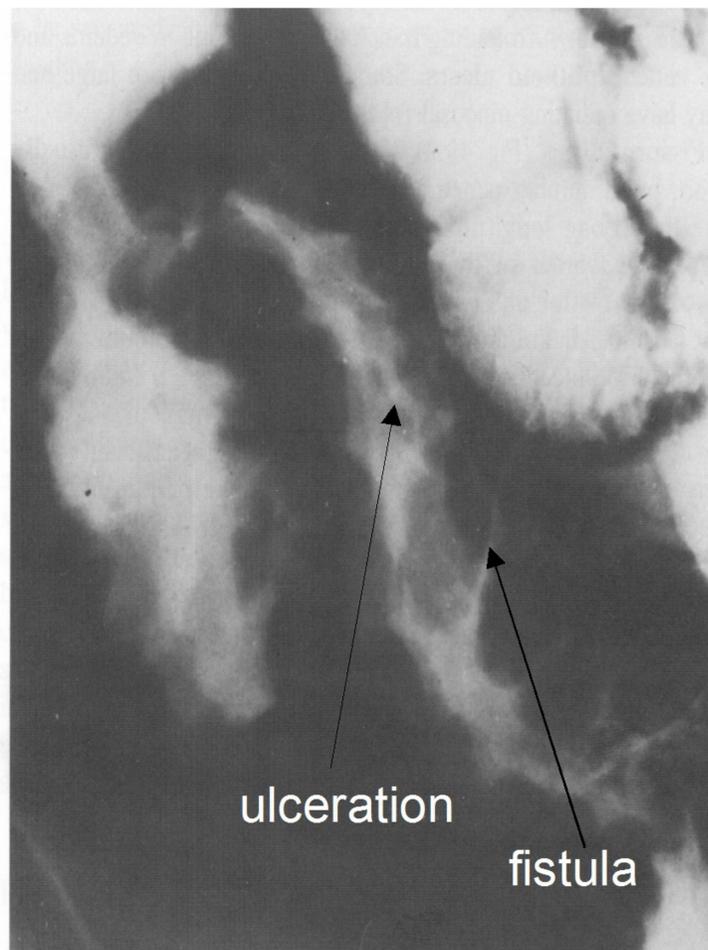
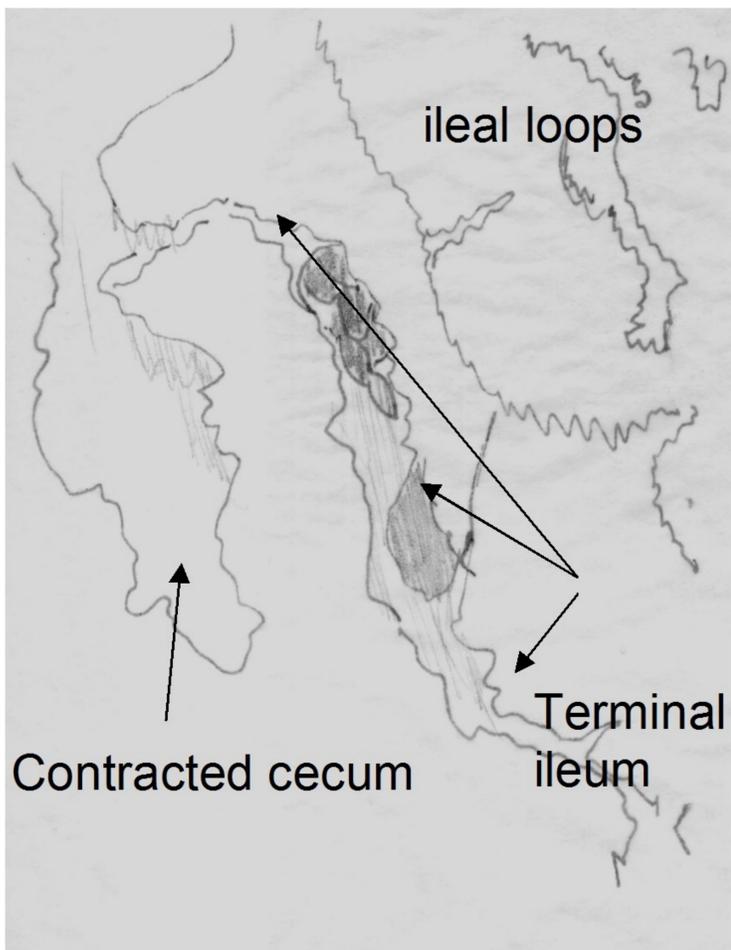
This is another example of importance of contrast studies in evaluating small bowel diseases. Inflammatory bowel disease “Crohn’s”.

Findings

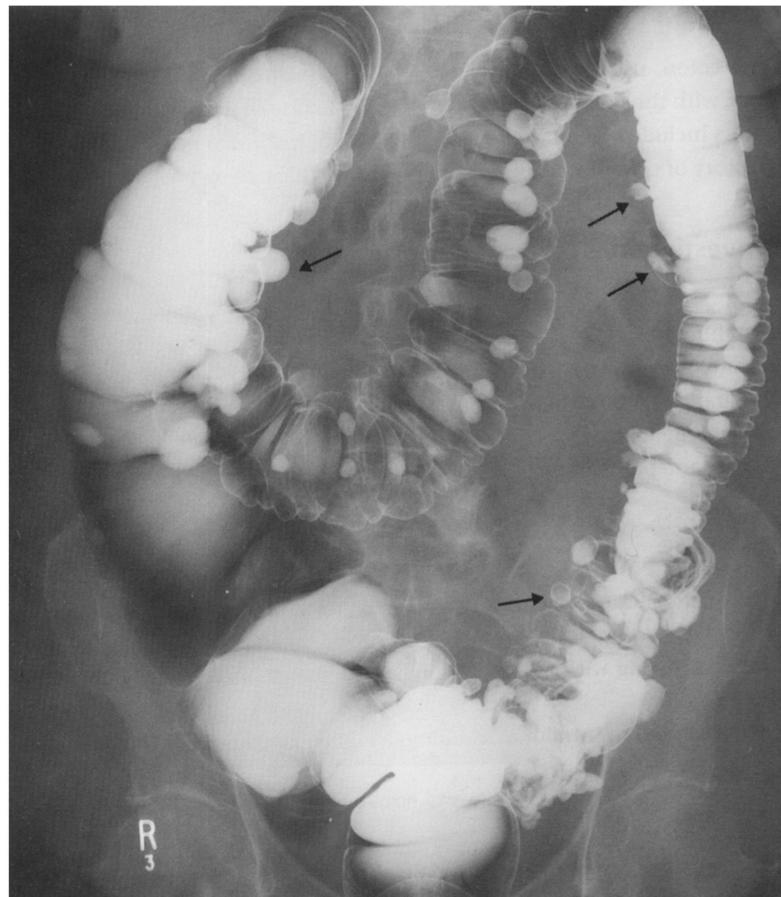
- Narrowing (stricture) of terminal ileum.
- Deep ulcerations which leads to formation of “Cobblestone” appearance.
- Bowel loops separation.
- Fistulae formation.

Crohn's Disease

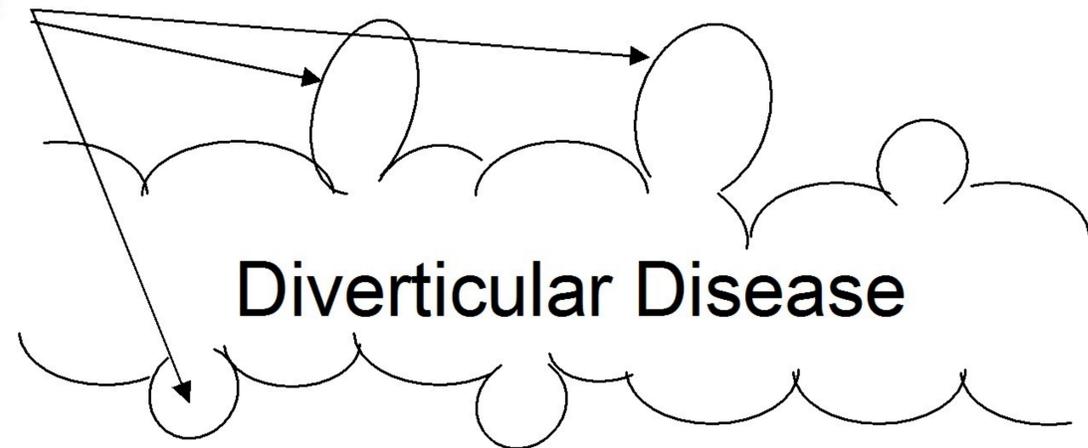
Ulcerations with "Cobblestone", Strictures, Fistulae



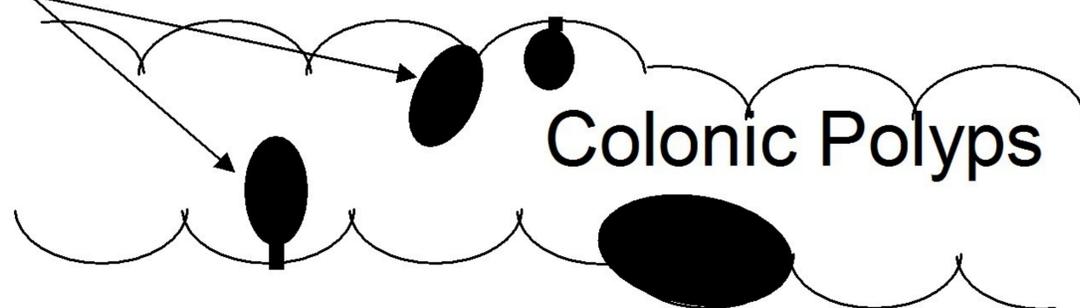
Case No.18 56 year adult male patient presented with abdominal pain and lower GI bleeding.



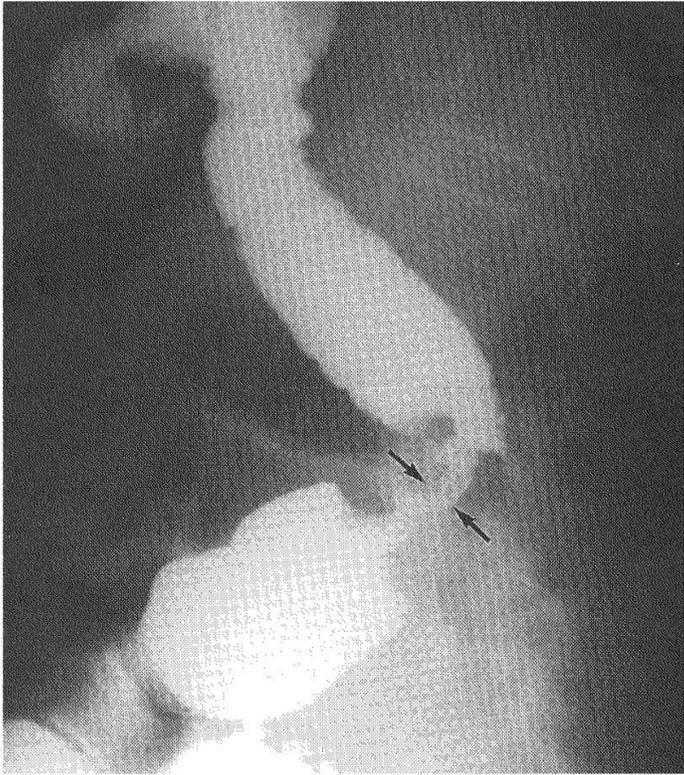
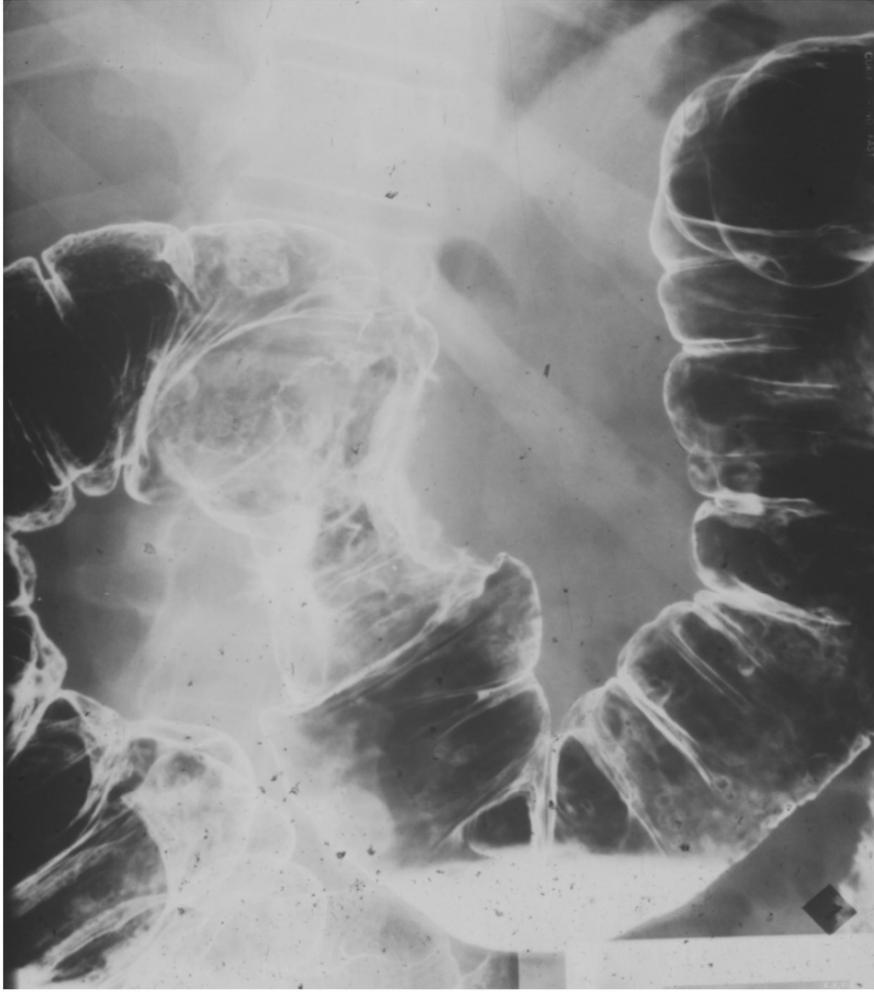
Diverticulae

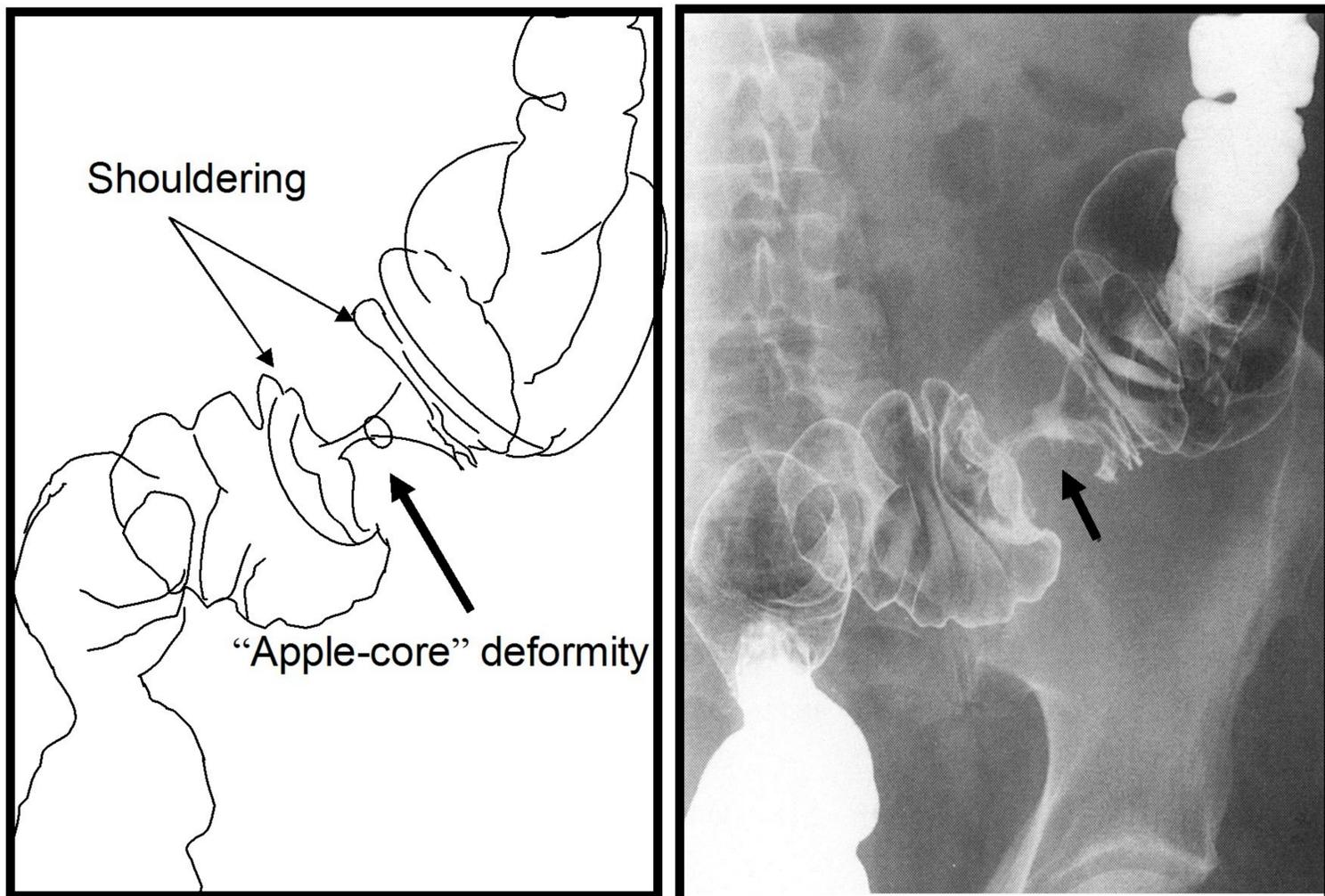


Polyps



Case No.19 Three different patients with almost similar presentations with constipation and lower GI bleeding.





These three examples shows colonic mass causing localized stricture at different levels with “apple-core” appearance and shouldering effect.

Another Application of Barium Enema is this example:

Two years old baby, presented being irritable, crying with mucous blood in the stool !.....

Here the clinical suspicion was **INTUSSUSCEPTION** .

The barium enema examination in such case can be

diagnostic and therapeutic

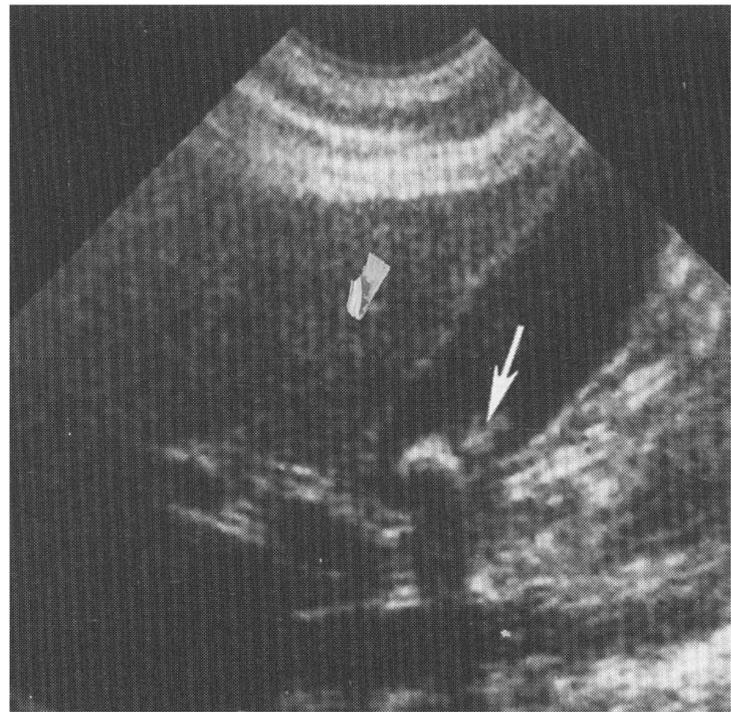
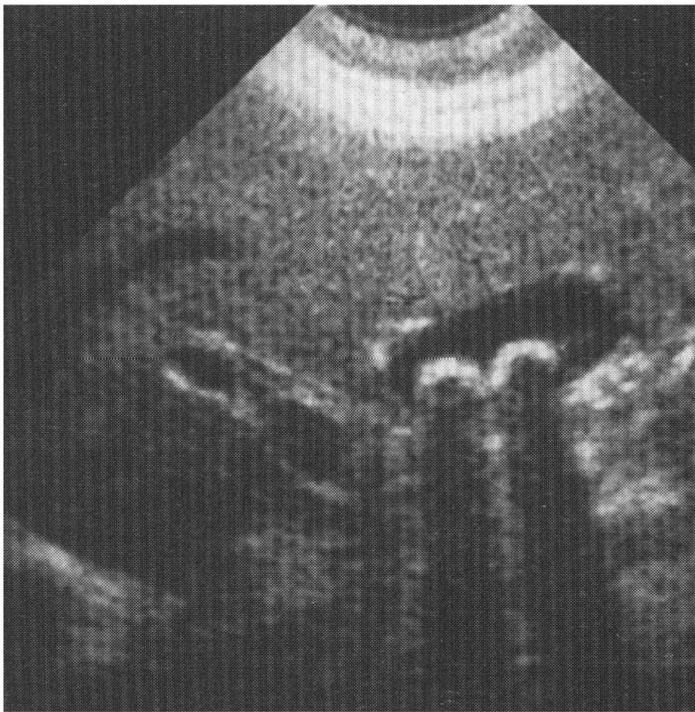


The above images represent part of barium enema examination which showed Filling defect with indentation at sigmoid colon in First image, while the Filling defect with indentation moved to transverse colon in Second image.

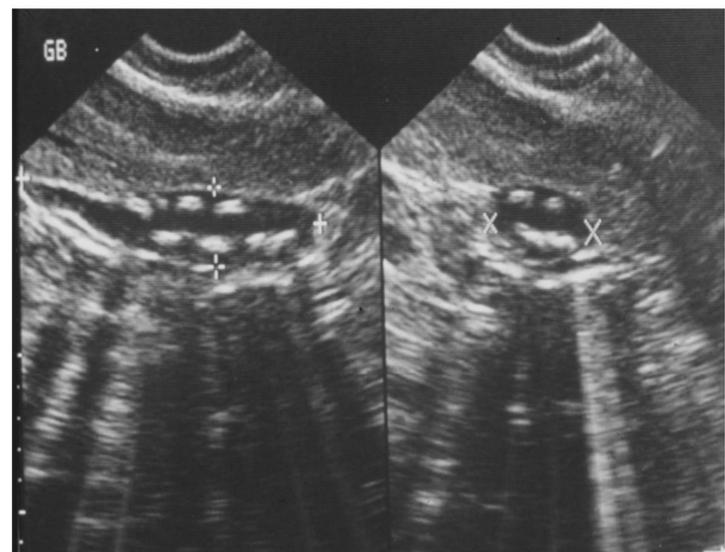
These findings confirm the diagnosis of intussusception diagnostic **AND** lead to reduction of the Intussusception (partial) as seen on second film therefore therapeutic. as well.

ROLE OF ULTRASOUND/ COMPUTED TOMOGRAPHY IN GASTROINTESTINAL DISORDERS

Case No.20 40 year adult female patient presented with right upper abdominal pain and vomiting.

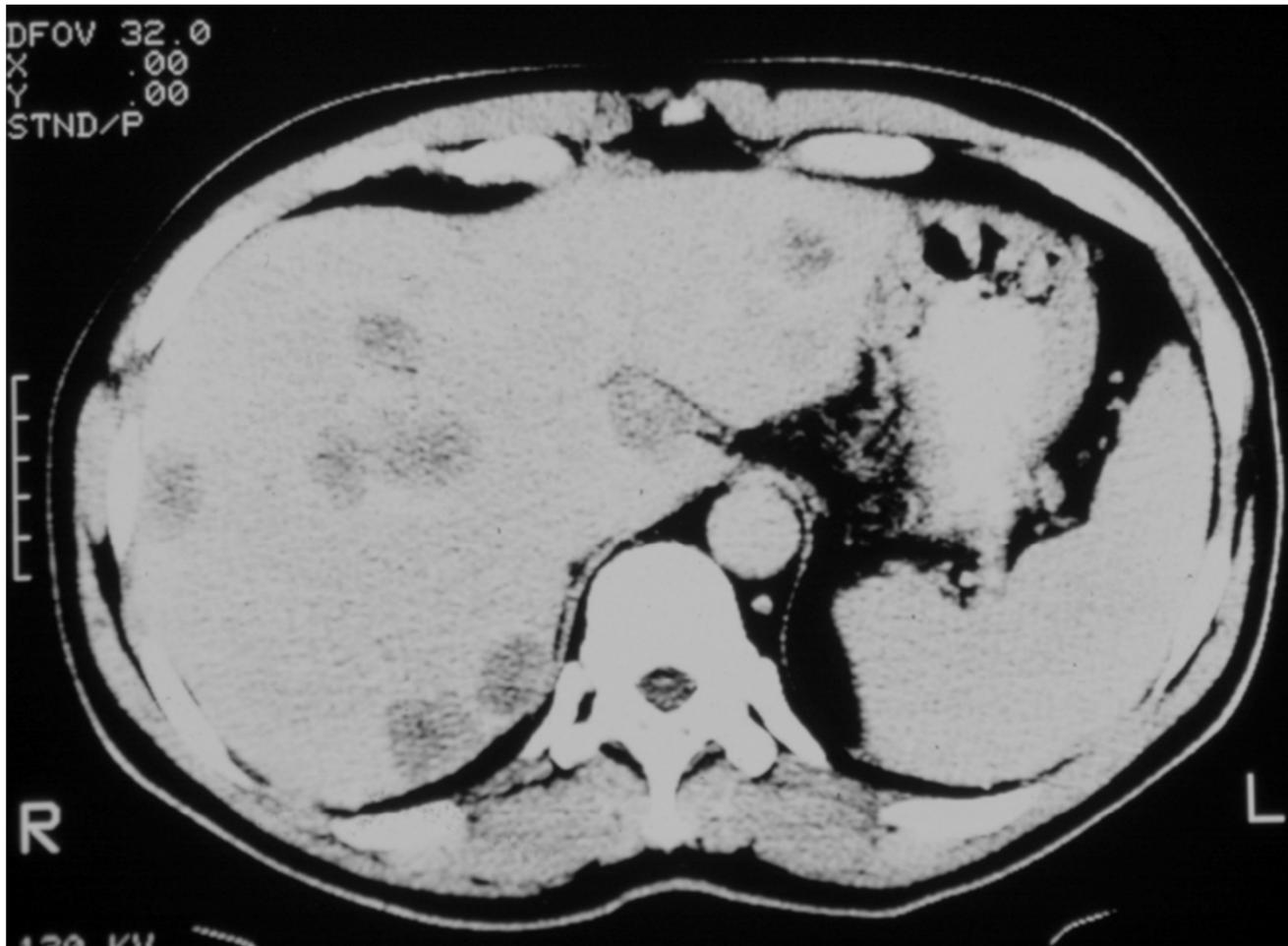


Another patient with similar presentation!

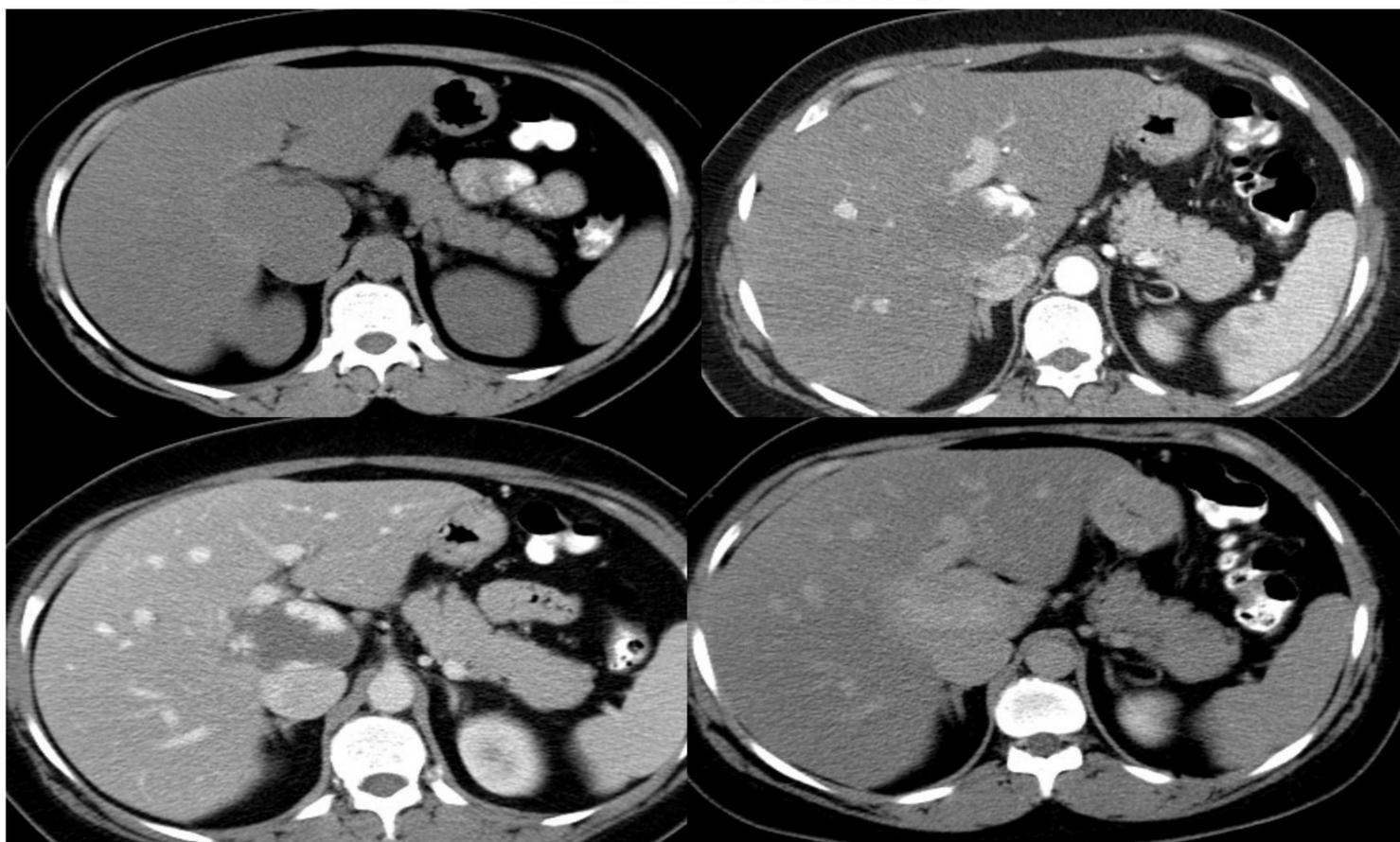


These are ultrasound images of the gallbladder demonstrating presence of echogenic foci within it. These are consistent with gall stones. What is the other possible differential of such appearance? And how can you differentiate between them?

These echogenic foci could represent air, however if put the patient in sitting Position air move upward while stones move downward.



Liver Metastasis



These are four images taken at same level with different stages of intravenous contrast enhancement : 1-non-contrast, 2-arterial, 3- venous and 4- delayed.

Importance of which is to show the better visualization of the lesion on the delayed scan. This was a case of **Hepatic hemangioma**

Another example is this patient with right upper quadrant pain and fever.

Image A is ultrasound of right upper quadrant (longitudinal)

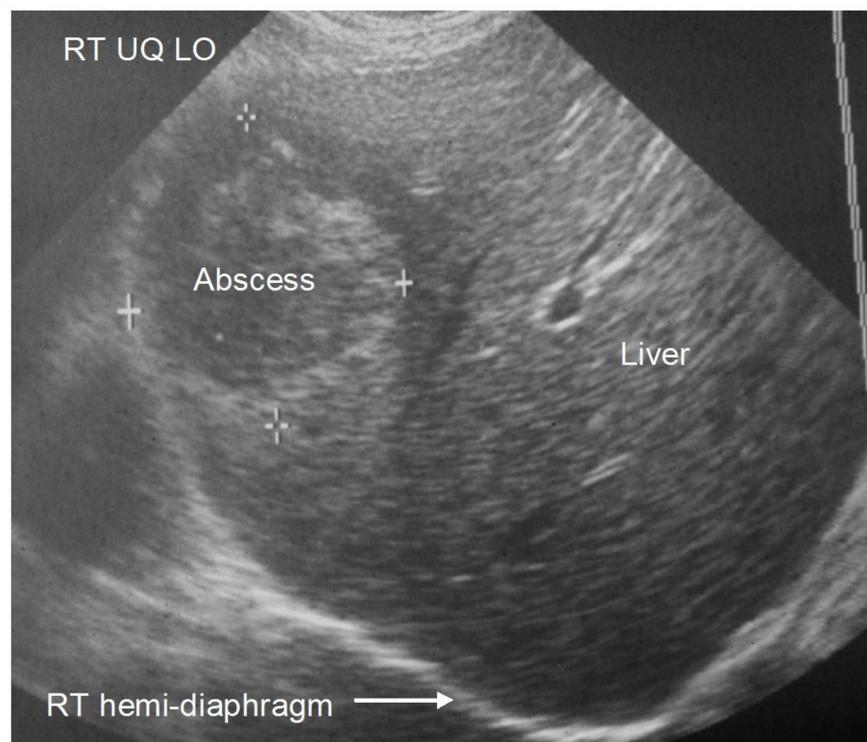
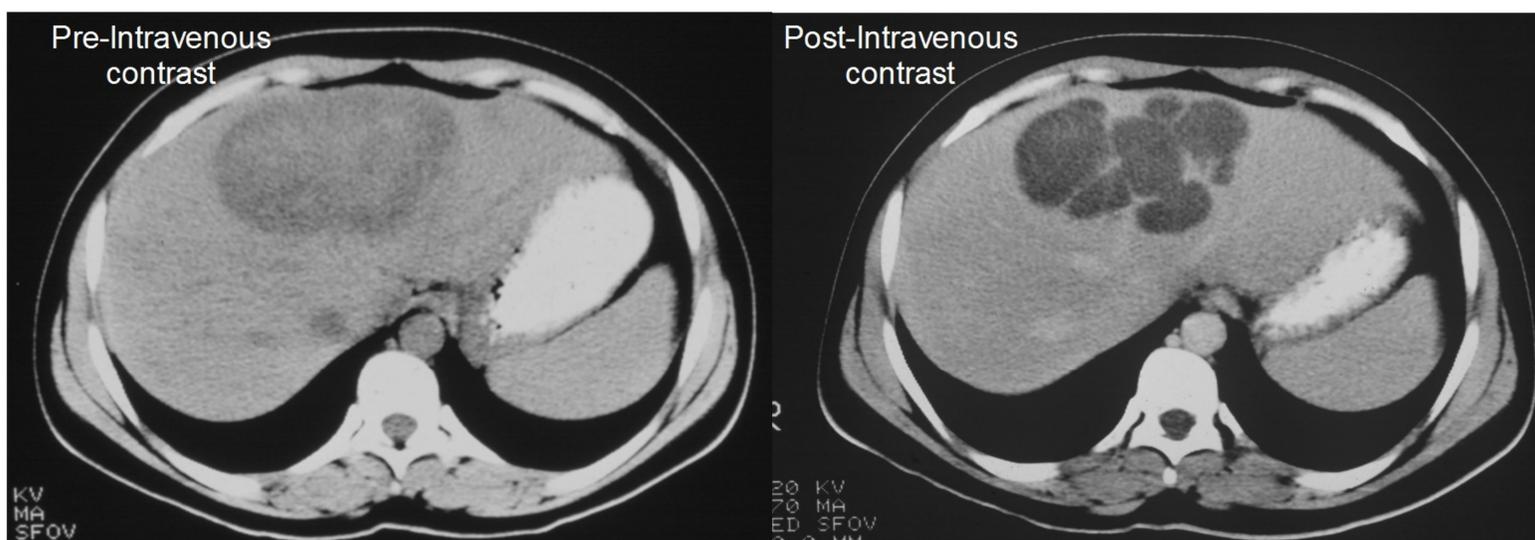
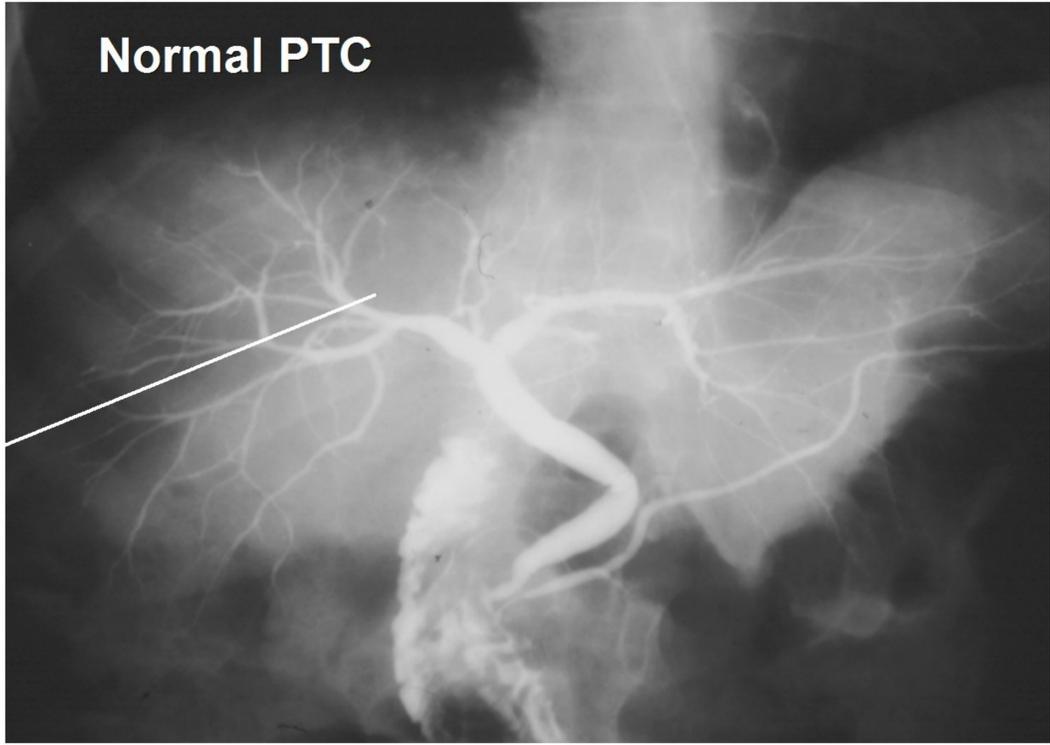


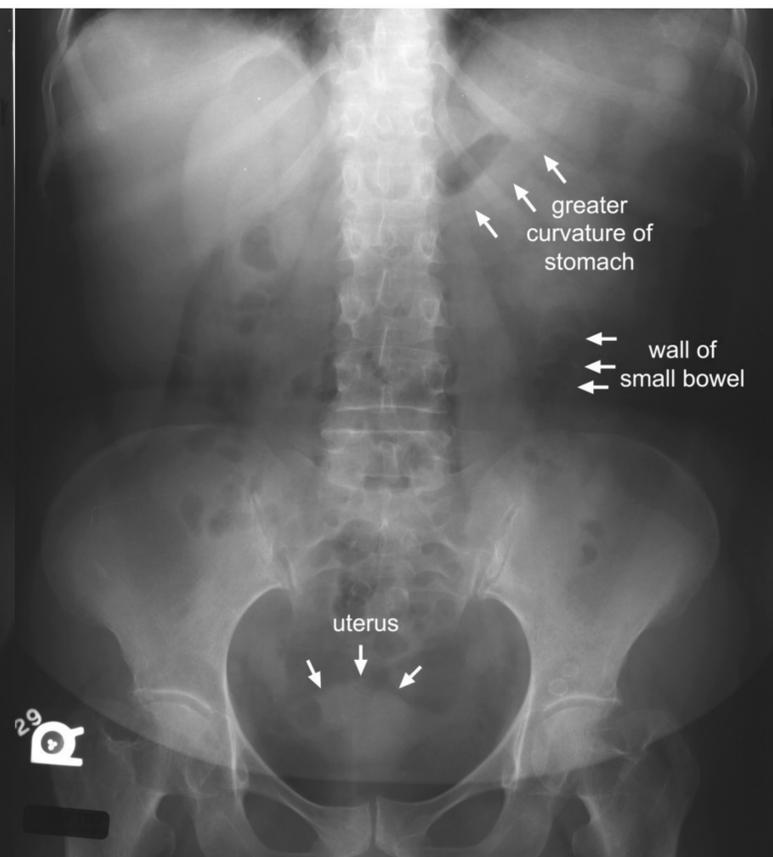
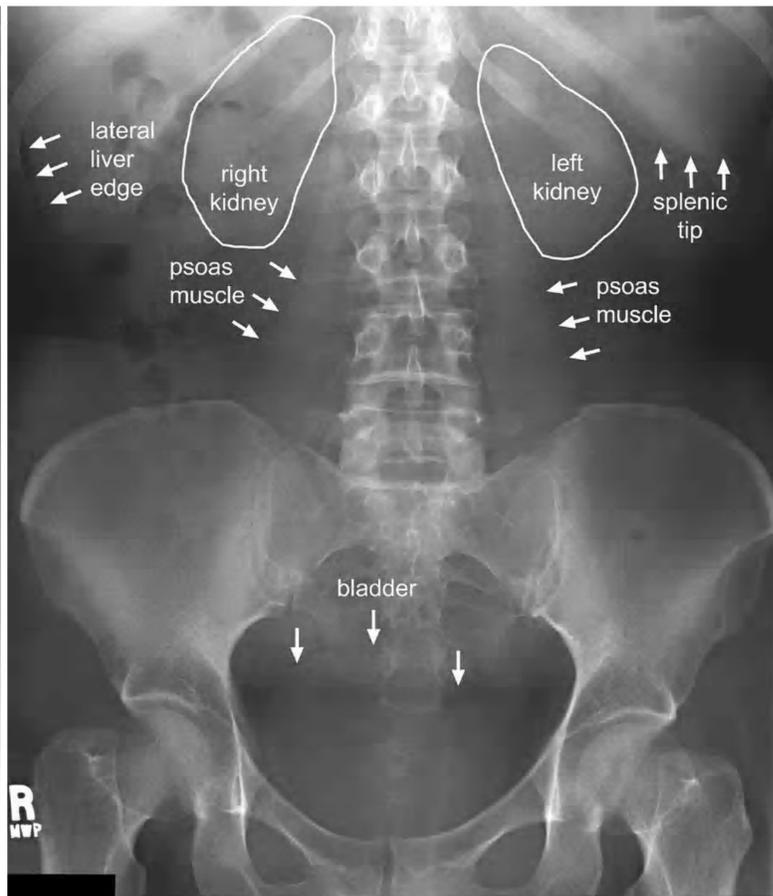
Image B: is CT scan of liver

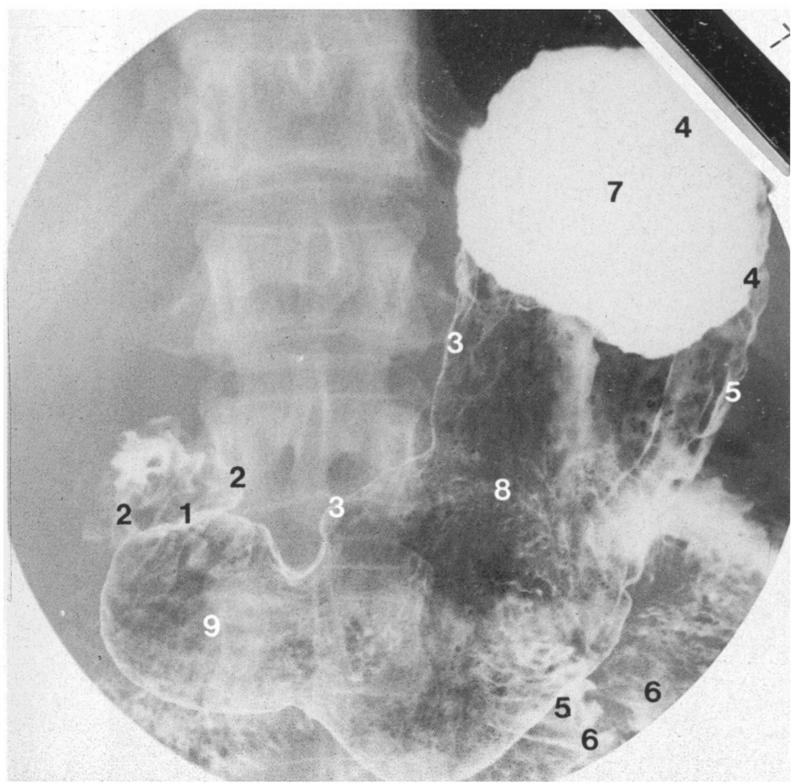
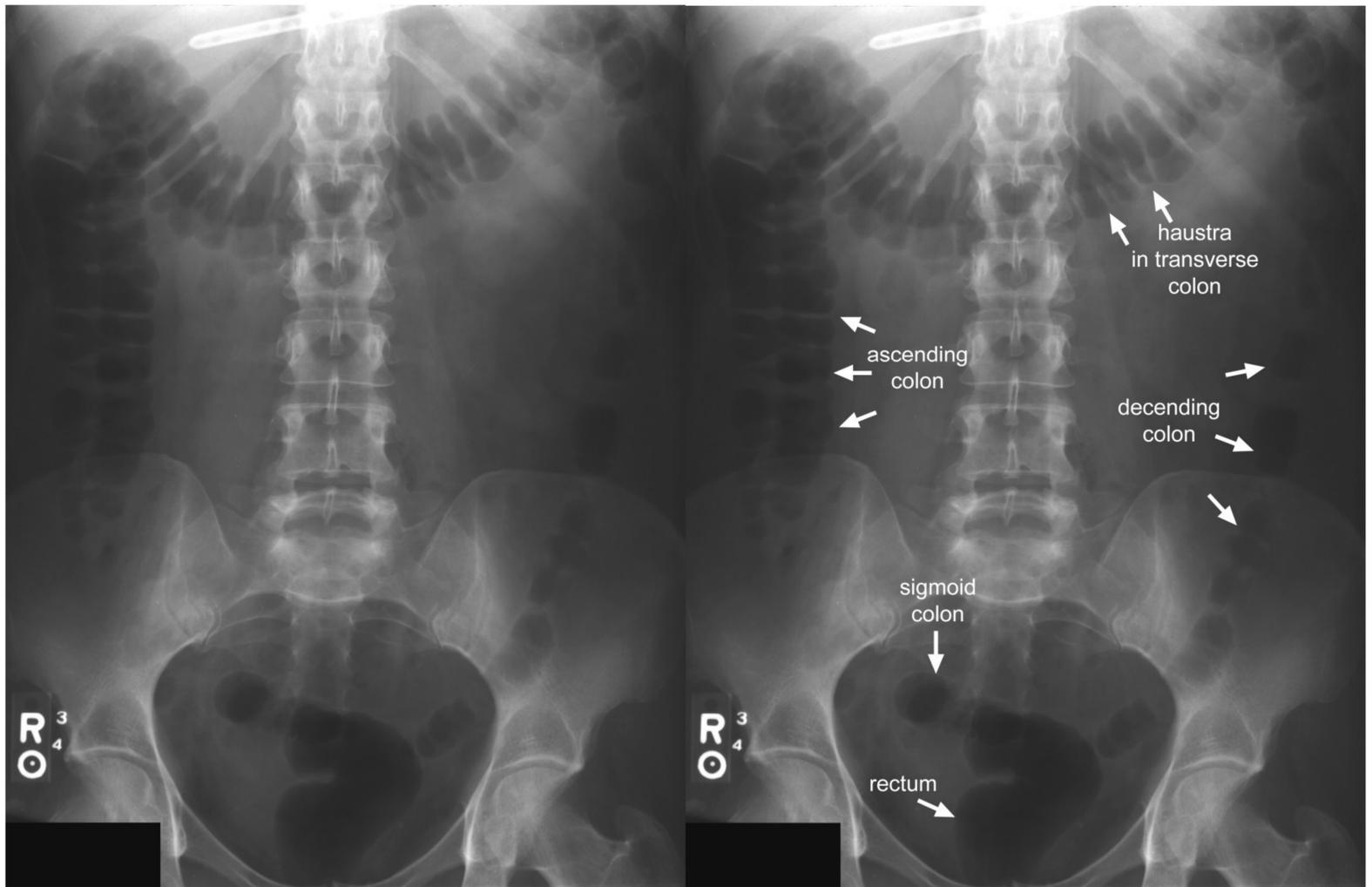


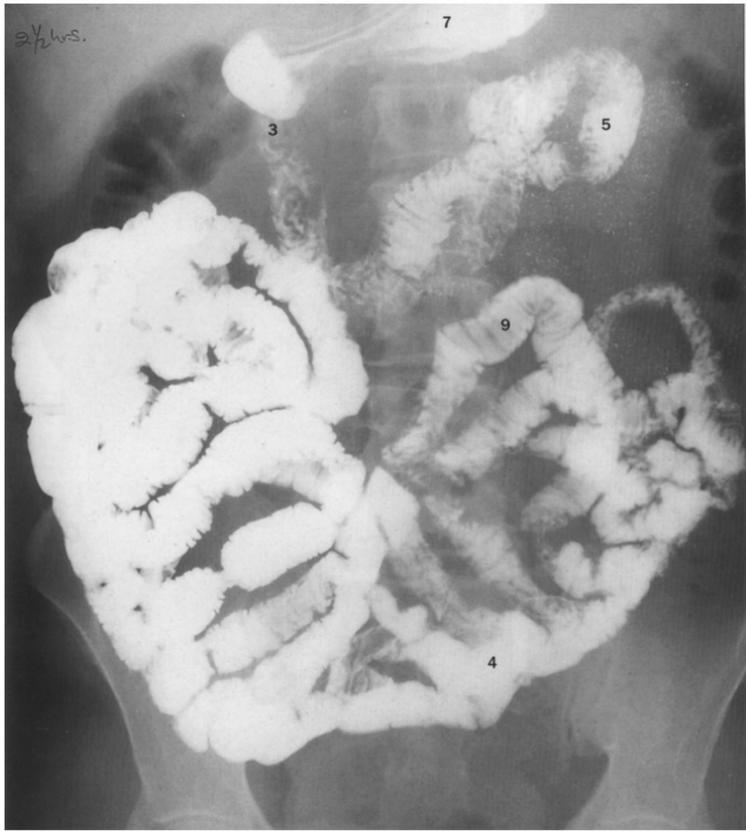
The CT scan showed the lesion more clearly and delineate its texture as it appeared cystic with septation. This was liver abscess. Differential may include Hydatid cyst.

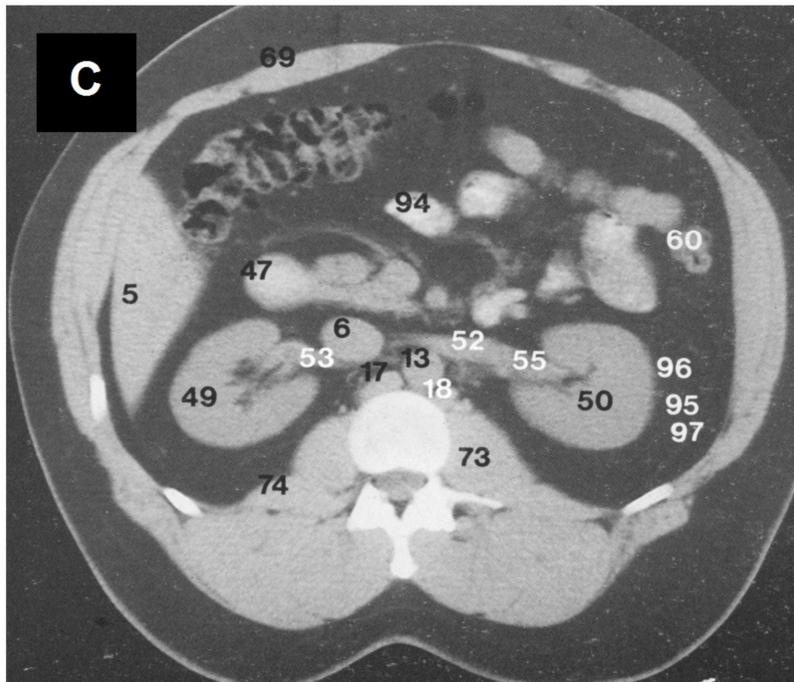
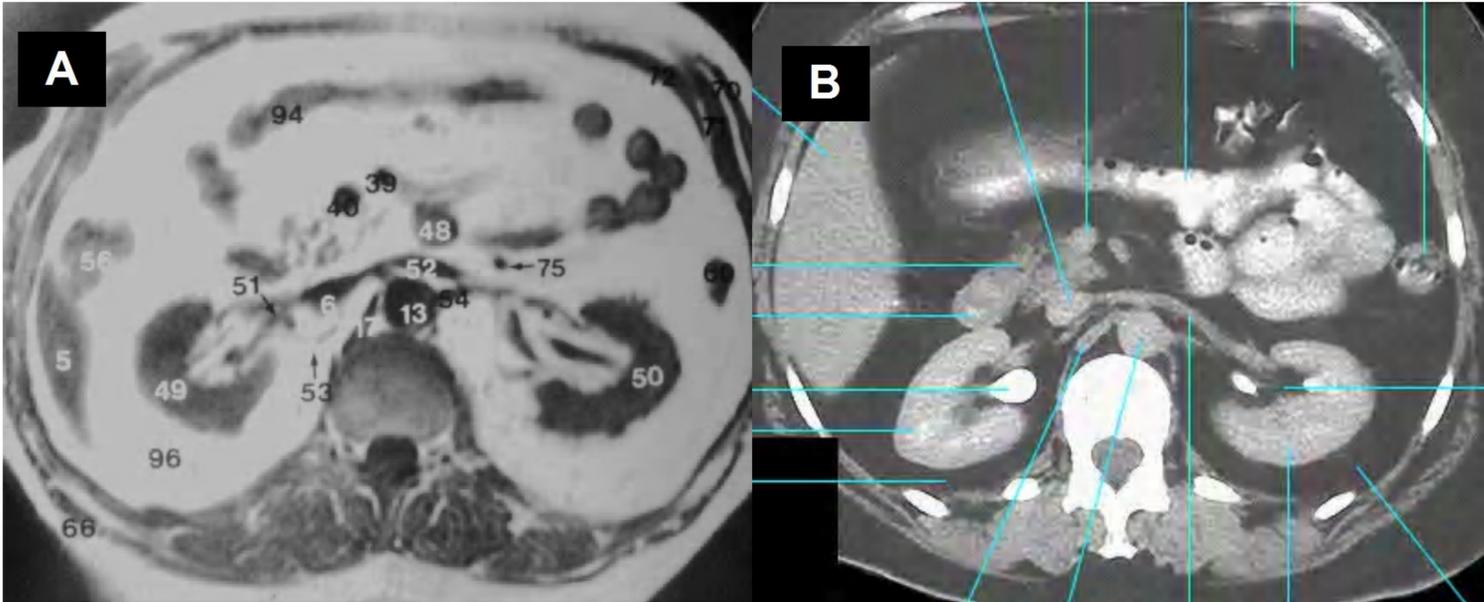


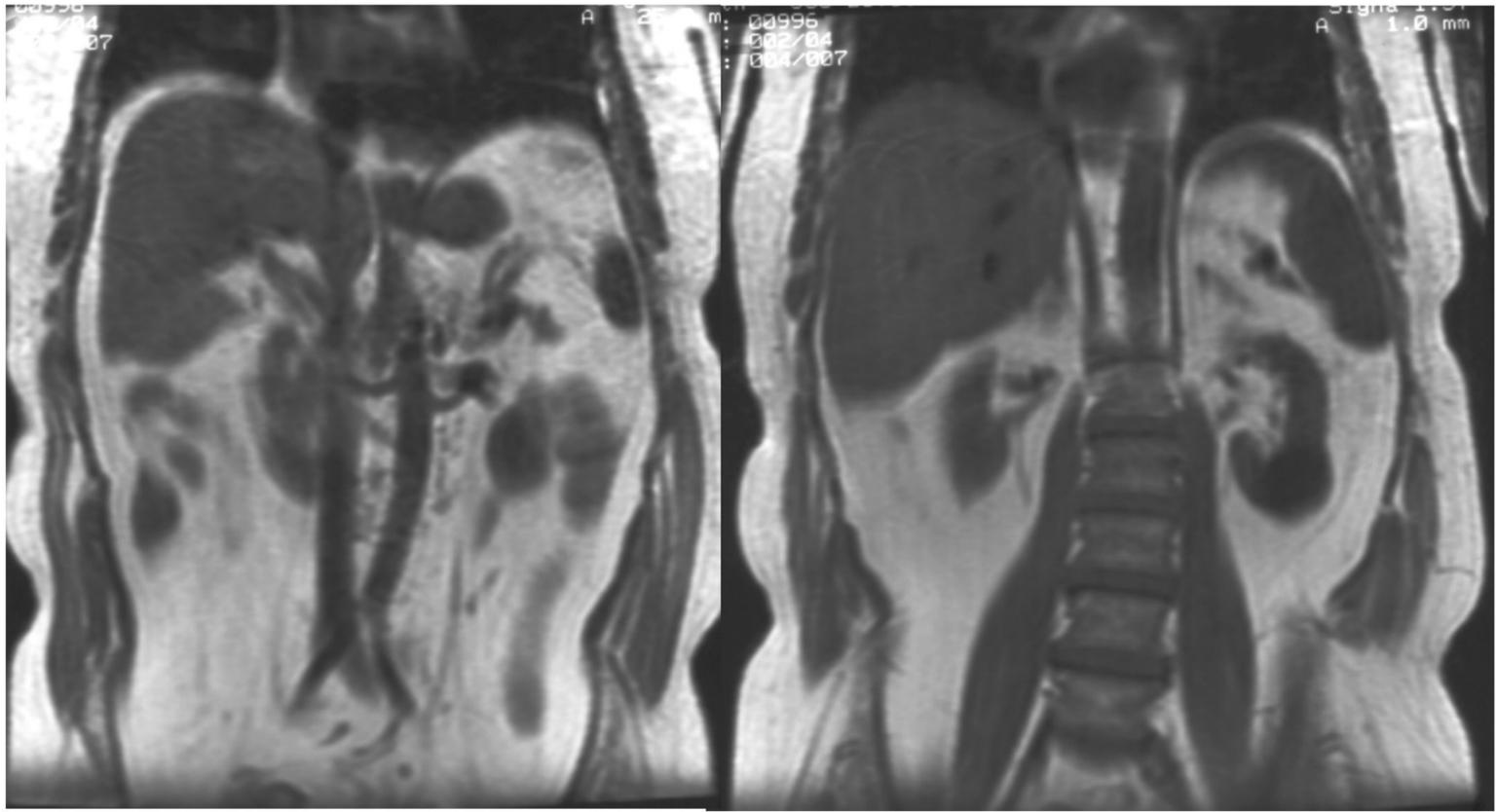
Gastrointestinal Tract Radiological Anatomy Slides



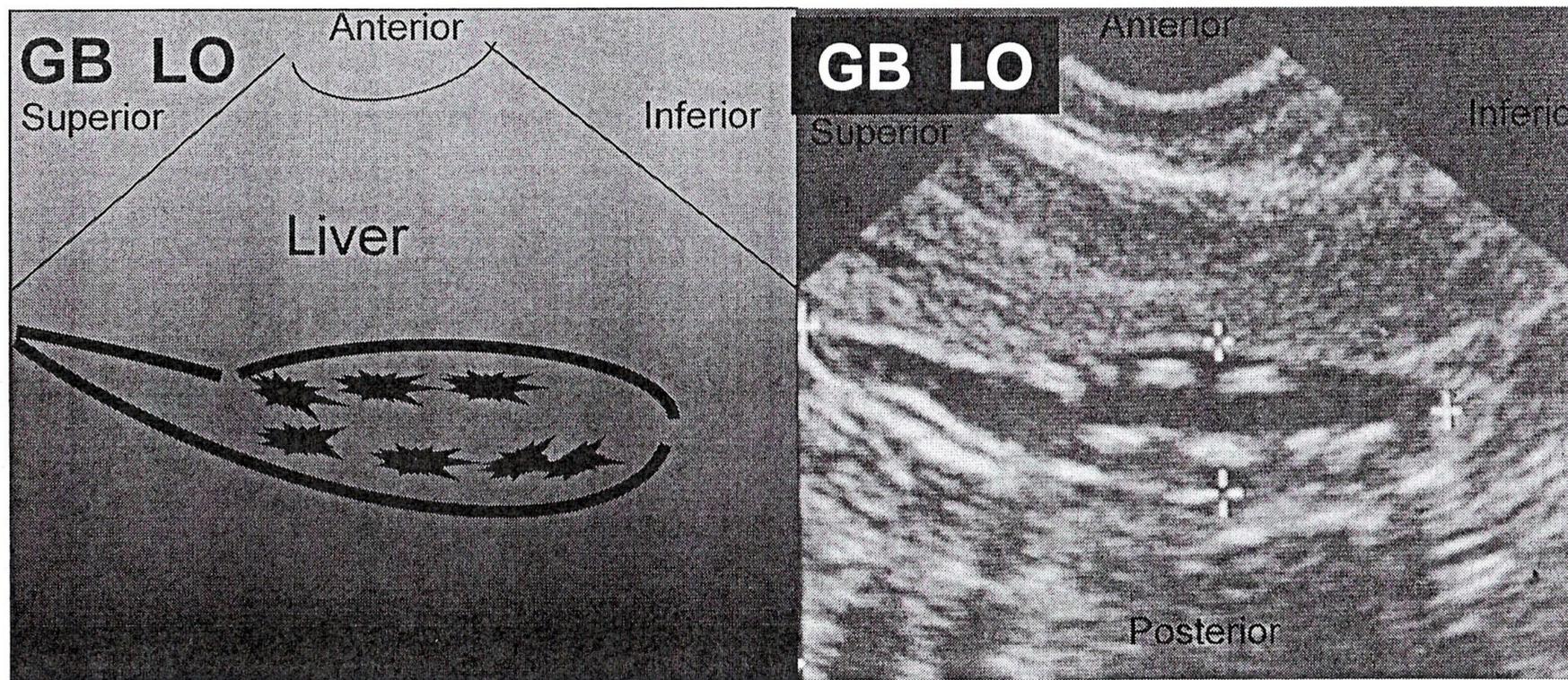




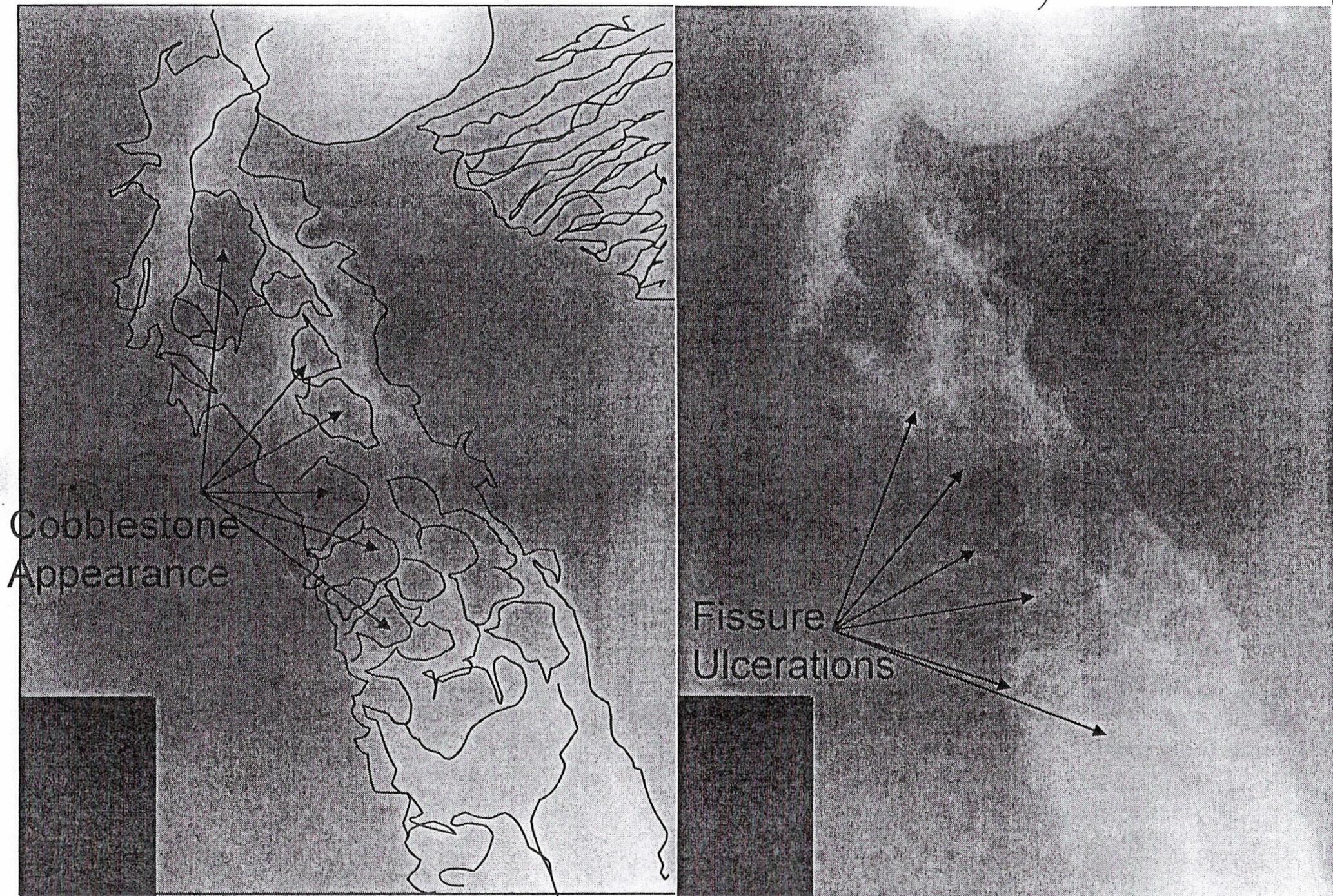




Normal MRI examination of abdomen (coronal images)



(Terminal ileum) Part of
Ba. follow through



Crohn's Disease