

Interpreting Abdominal X-Rays

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Indications for Abdominal X-Ray

- Emergent evaluation of bowel gas
 - Emergent evaluation of pneumoperitoneum
 - Assessment of radiopaque foreign bodies
 - Assessment of lines/tubes
- If CT is not immediately available

Outline

- 1 Patient details.
- 2 Projection.
- 3 Technical quality.
- 4 Obvious abnormalities.
- 5 Systematic review of the radiograph.
- 6 Summarize your findings.

Abdominal X-Ray Views

Supine (AP) Abdomen

Most pathology

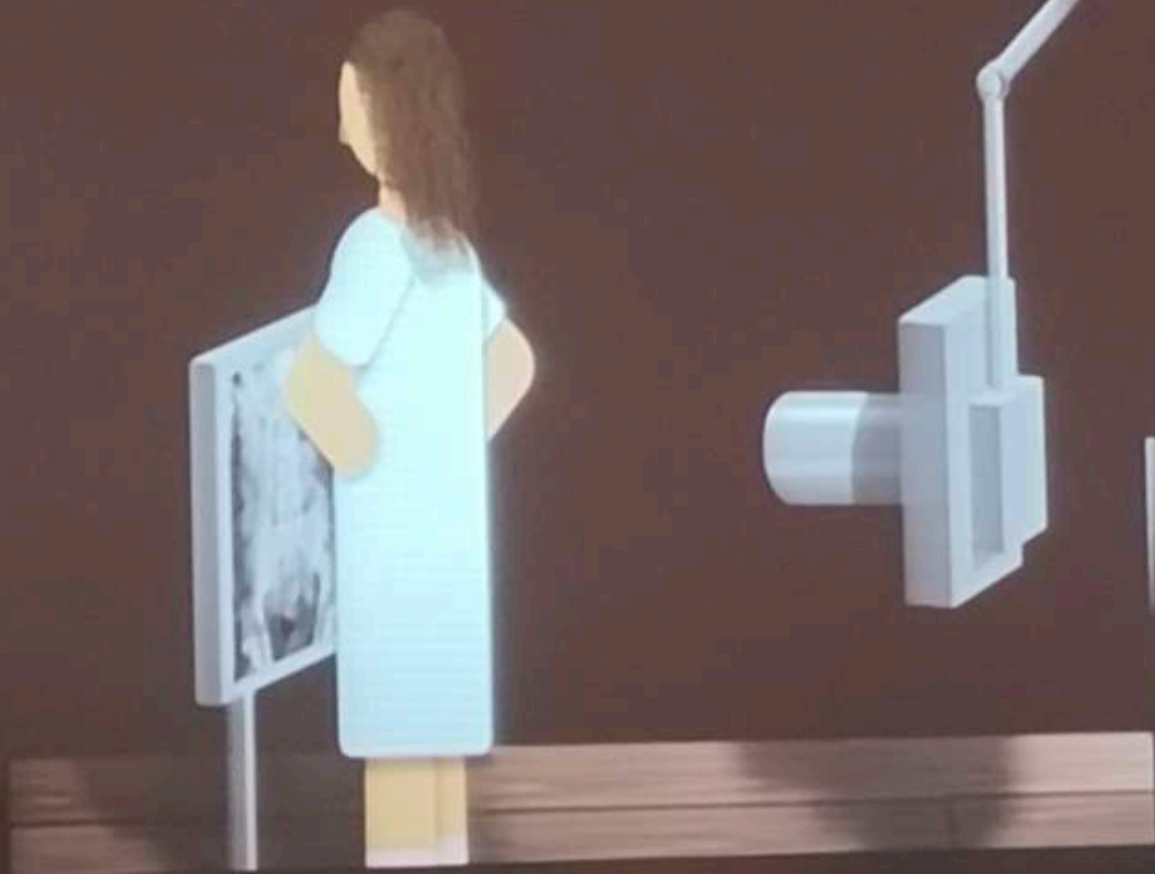
(if AXR is useful at all)

a.k.a. "KUB"

(kidneys, ureter, bladder)



Abdominal X-Ray Views

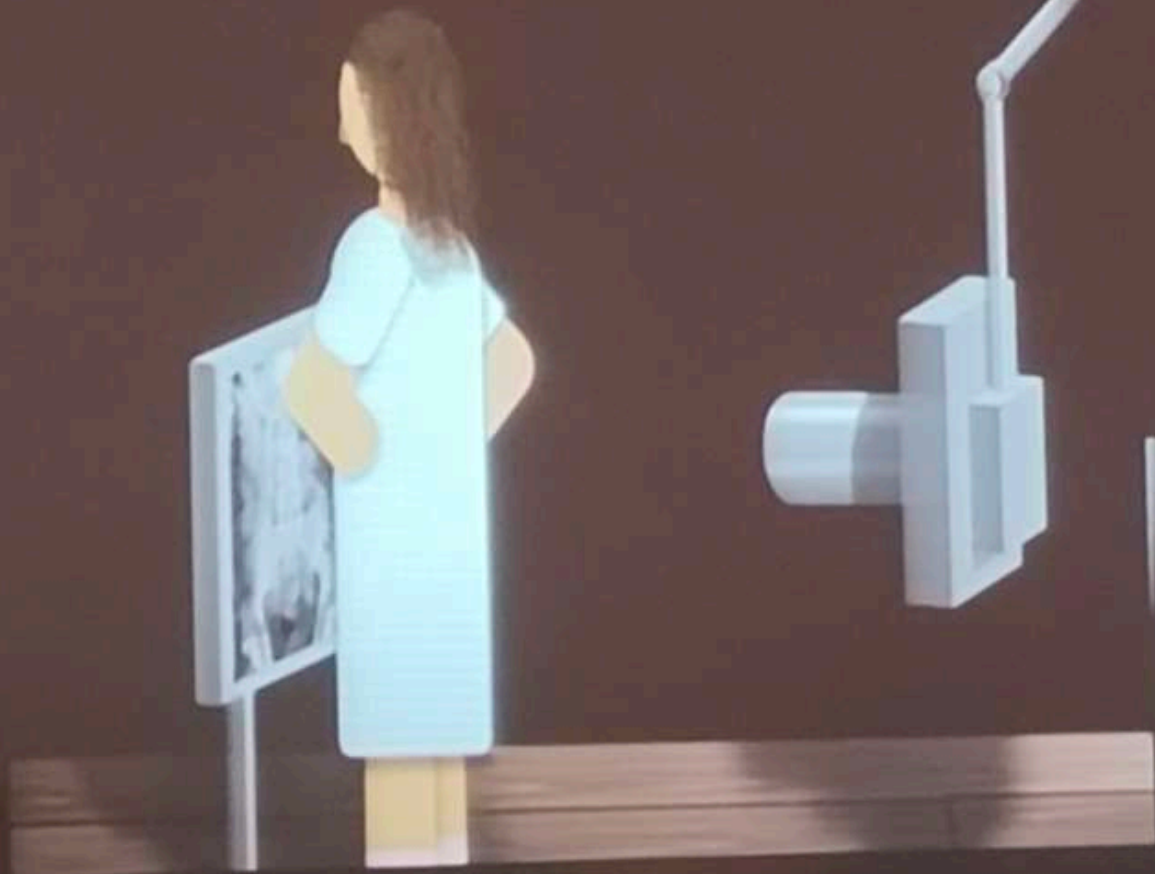


Upright Abdomen

Small bowel
obstruction



Abdominal X-Ray Views



Upright Abdomen

Small bowel
obstruction



Abdominal X-Ray Views



Upright Chest

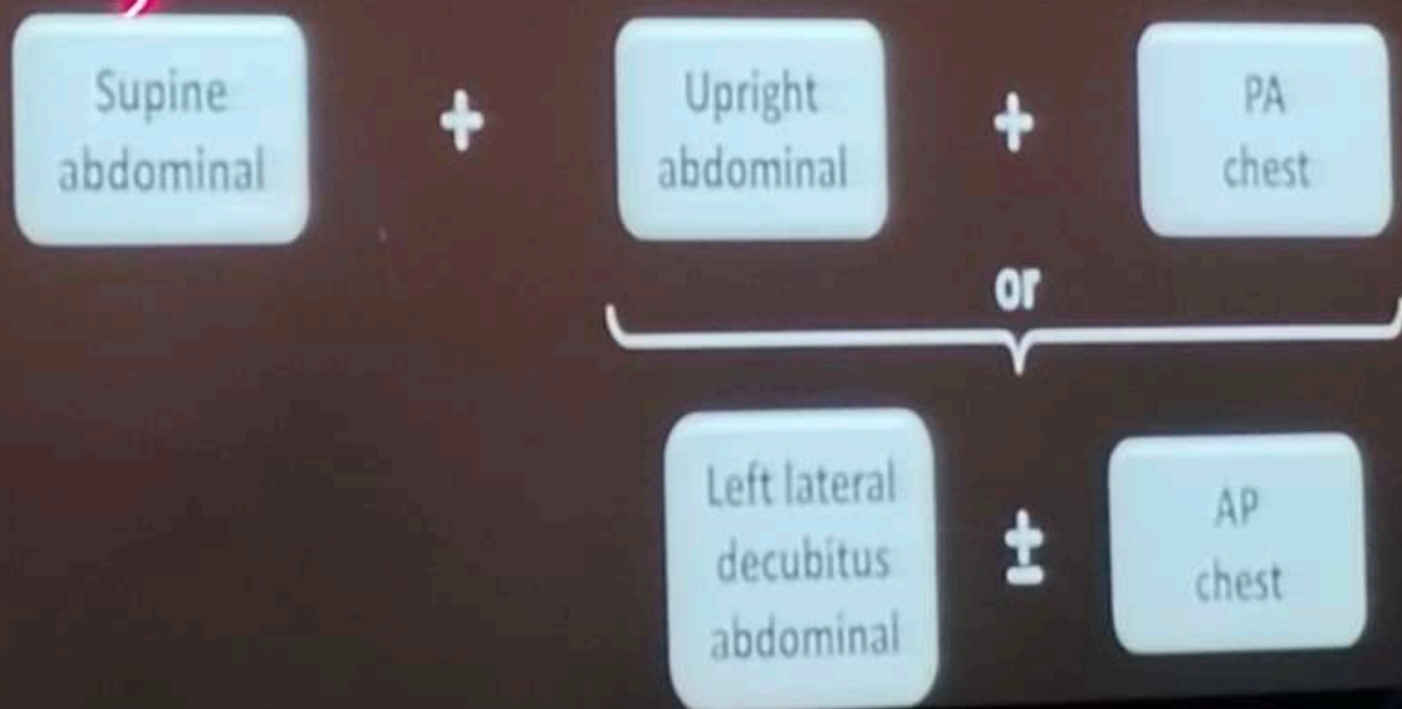
Pneumoperitoneum

("free air under the diaphragm")

Intrathoracic conditions leading
to referred pain to abdomen

Abdominal X-Ray Views

An acute abdominal series (a.k.a. "abdominal 3 view")
is a largely obsolete series of films consisting of:



Technical Quality

1. Image Field:

- Must include the hemidiaphragms down to the symphysis pubi
- There's no need to include the hemidiaphragms in KUB.

2. Penetration:

- Must see the spinous processes through the vertebral bodies.



Density

Substance/Structure

Black

Gas / Air

Dark grey

Fat

Light grey

Soft tissue
Fluid

"White"

Bone
Calcifications

Intense white

Metal

Anatomy – Bowel Gas

Small Bowel

Usually located centrally

Mucosal folds (a.k.a. valvulae conniventes, Kerckring folds) are relatively thin and span the width of the bowel

Upper limit of normal for diameter: 3cm

Large Bowel

Usually located peripherally

Mucosal folds (haustra) are relatively thick, and *usually* do not span the width of the bowel

ULN for diameter

- Colon: 6cm
- Cecum: 9cm

The "3-6-9 rule"



Not a
normal
film!

Anatomy – Bowel Gas



Normal bowel gas patterns

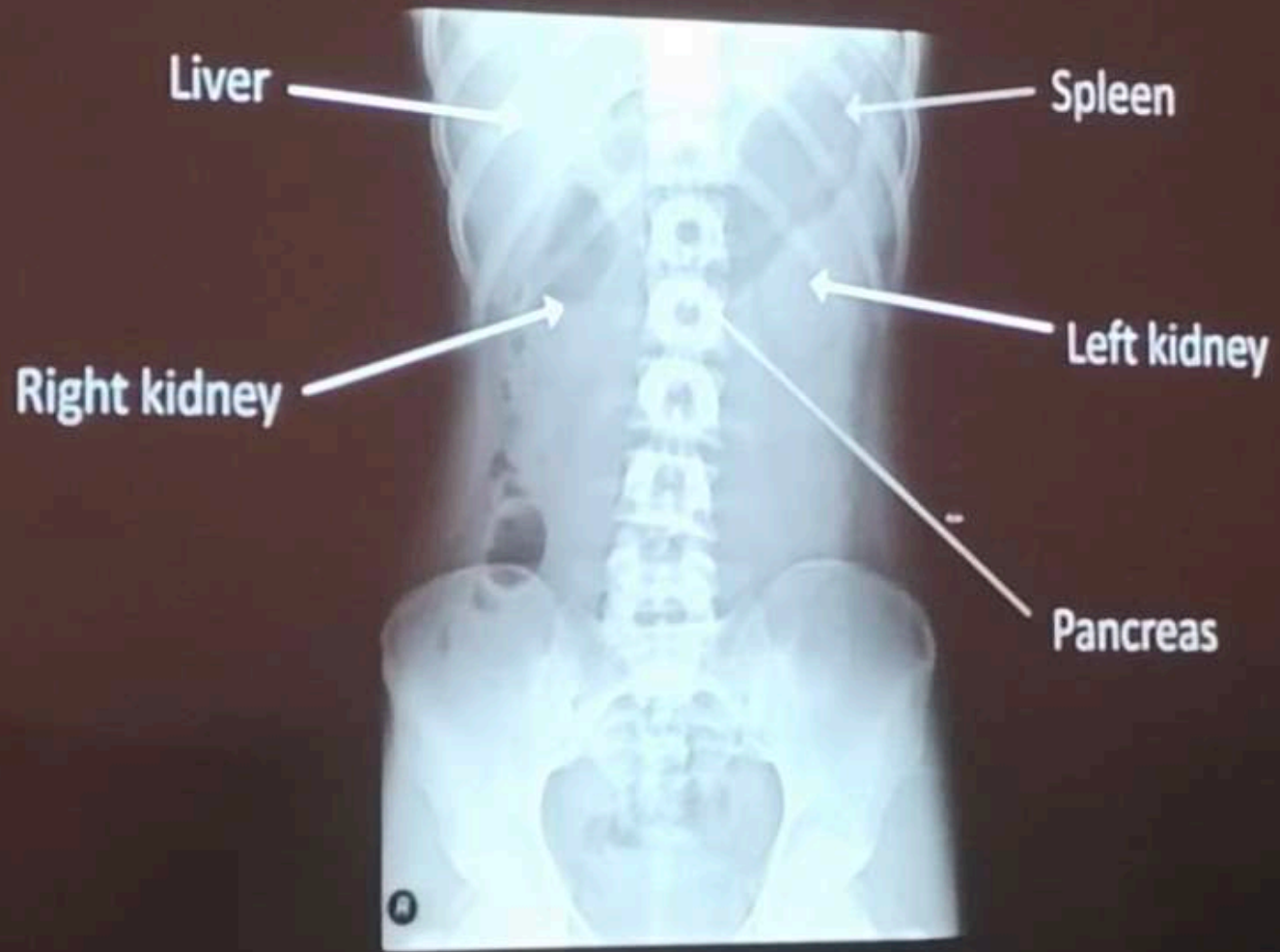


Small Bowel



Large Bowel

Anatomy – Solid Organs



Small Bowel Obstruction



Supine

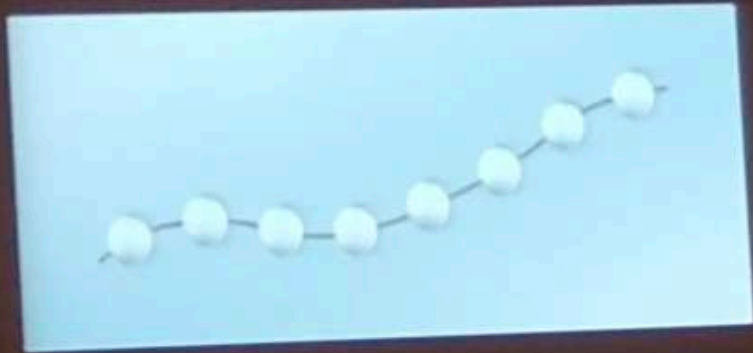


Upright

Small Bowel Obstruction

when bowel filled
with fluid and air is
very less

"String of pearls" sign



Upright



(Adynamic) Ileus

Distinguishing an ileus from SBO on plain films can be difficult, if not impossible.

takes history of recent surgery

then biochemical analysis

present faster than obstruction



Cecal Volvulus

Findings include:

- **Massively dilated colon**
- **Haustra usually present**
- **Lack of colon in RLQ**



Cecal vs. Sigmoid Volvulus



Sigmoid



Cecal

Constipation

Findings include:

**Soft tissue-like opacities
with internal mottled air
within the large bowel**



Constipation

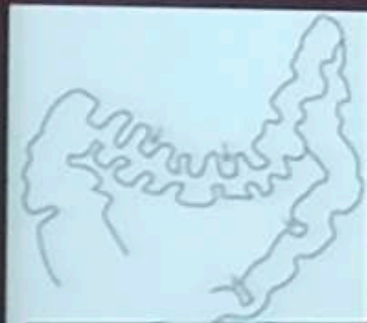
Findings include:

Soft tissue-like opacities
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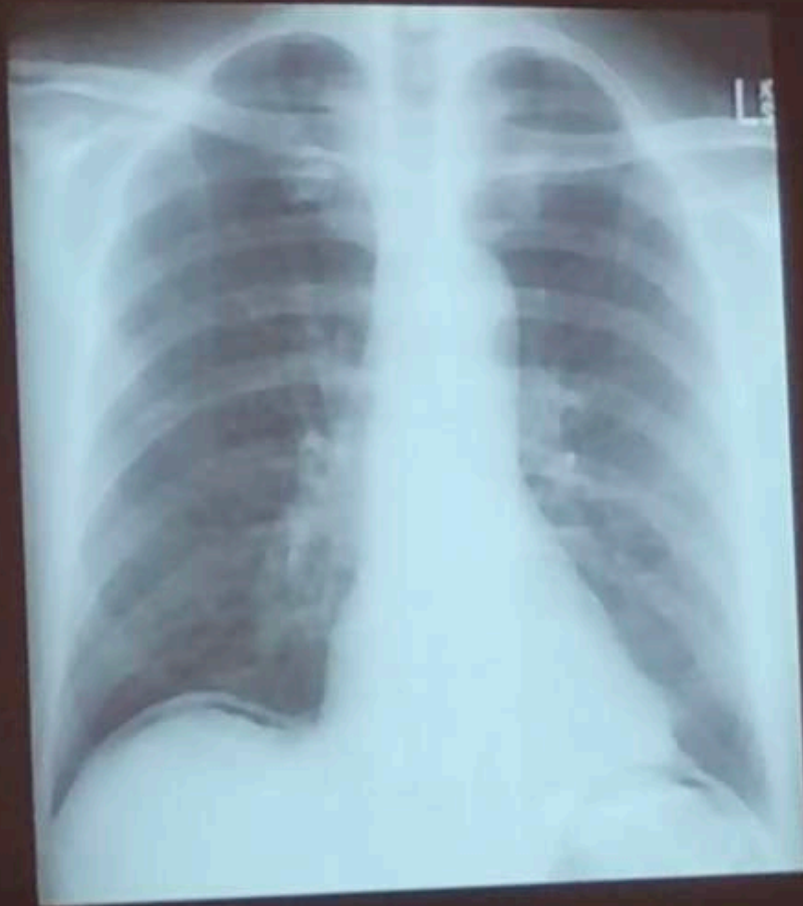
Thumbprinting

- Thumb-shaped indentations in the bowel wall caused by edema of haustra related to infection/inflammation
- Etiologies include:
 - Inflammatory bowel disease
 - Infectious colitis (e.g. C. diff)
 - Diverticulitis
 - Ischemic colitis



pt will be acutely ill

Pneumoperitoneum



Upright chest

air in diaphragm

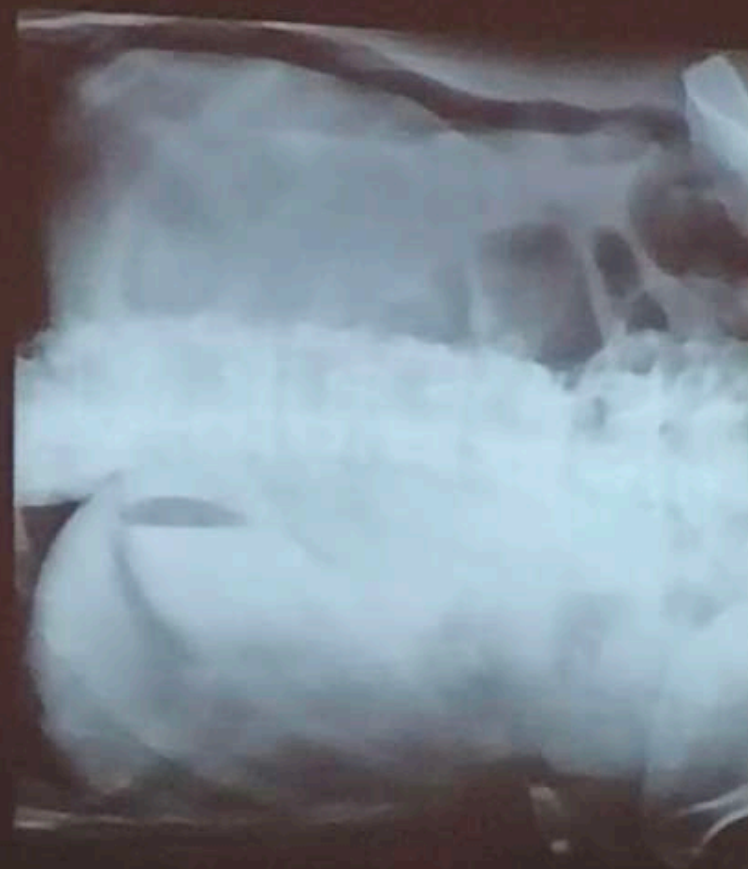
Etiologies include:

- Peptic ulcer disease
- Bowel ischemia (any cause)
- Appendicitis
- Colitis
- Diverticulitis
- Penetrating abdominal trauma
- Foreign body ingestion
- Endoscopic complication
- Immediately post-surgery (normal)

Pneumoperitoneum



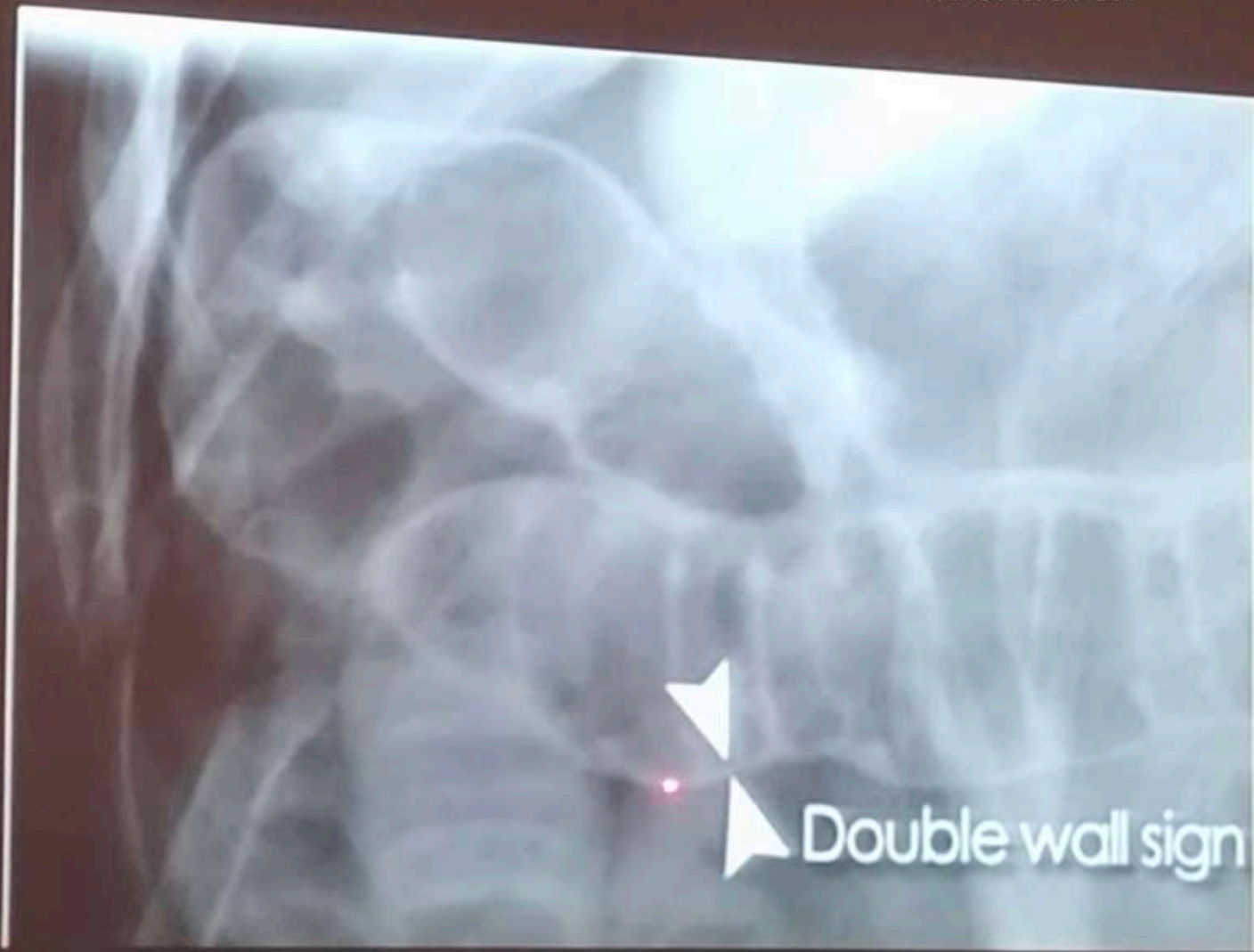
Upright chest



Left lateral decubitus

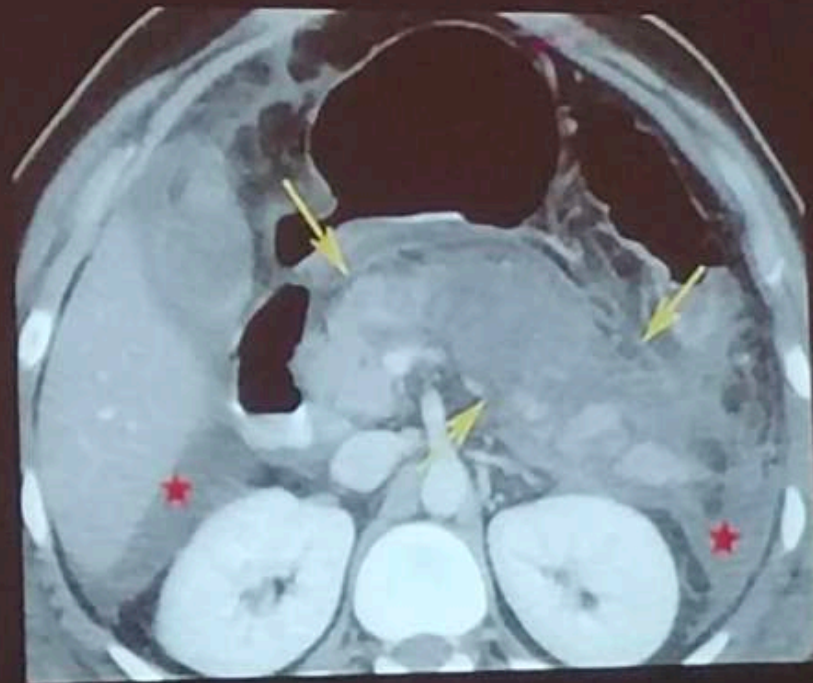
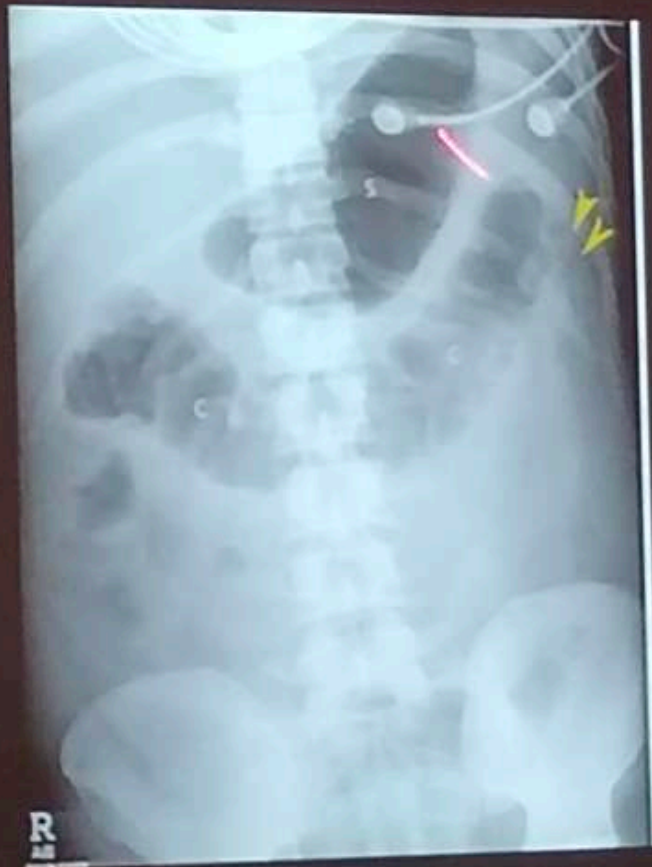
air outside bowel
wall

wriggler sign usually
in children



Double wall sign

Colon Cut Off sign



Nephrolithiasis

- Majority of kidney stones are radiopaque (contain calcium)
- Can be present in the:
 - Renal pelvis
 - Ureter
 - Bladder
 - Urethra



Pancreatic Calcifications

Etiologies include:

- Chronic pancreatitis
- Cystic fibrosis
- Pancreatic cancer
- Senile (a.k.a. senescent)



Foreign Bodies

Hip Prosthesis

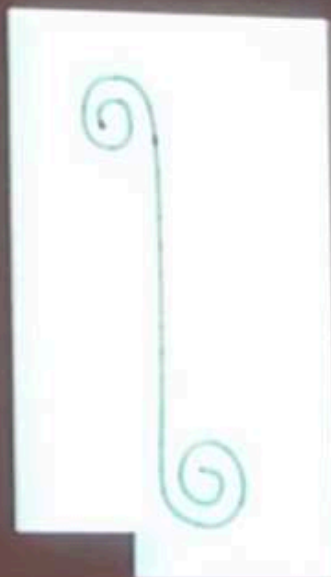


Endovascular Aneurysm Repair (EVAR)



Foreign Bodies

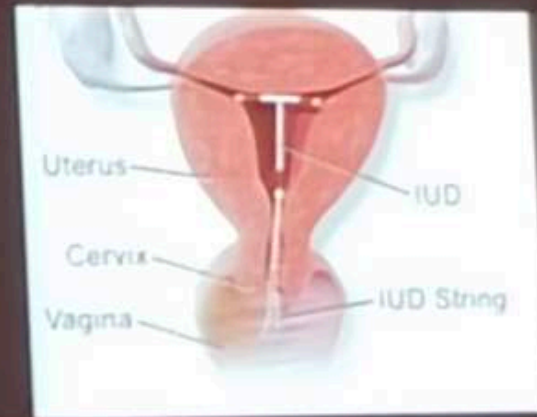
Ureteral (JJ) Stent



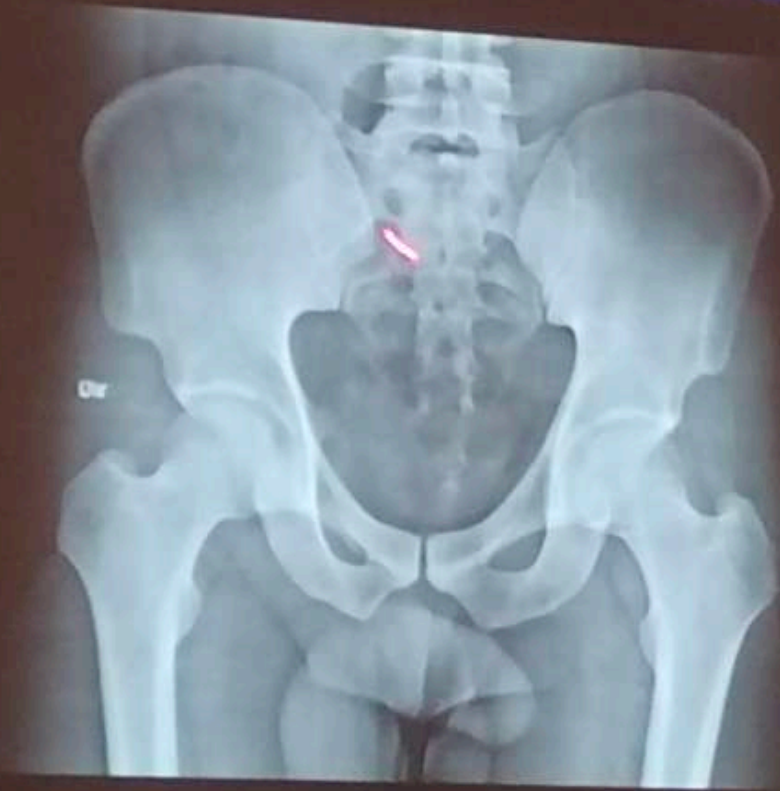
Intrauterine Device (IUD)



Correct location



Bones



SUMMARY AND CHECK LIST FOR ABDOMINAL XRAY

Patient details.

Projection.

Technical quality. (collimation)

Obvious abnormalities.

Systematic review of the radiograph.

Summarize your findings.