A SYSTEMATIC APPROACH TO X-RAY INTERPRETATION
Part 2

Abdominal Plain Films, Anatomy & Common Pathologies

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Objectives

• To review the anatomy relevant to abdominal x-rays.
• To learn a systematic approach to x-ray interpretation.
• To apply this approach to interpreting abdominal x-rays.
• To identify some common pathologies detectable by abdominal x-ray.
Surface anatomy of the abdomen
THE ABDOMINAL X-RAY (AXR)

- Of more limited value in diagnosis than CXR.
- Standard AXR is taken in supine position where x-rays are in AP projection with patient lying down on his/her back.
- May also be taken with patient in lateral decubitus or upright positions in order to visualise an air-fluid level.
- AXR is of most use in the patient with an acute abdomen.
5 main densities are seen on XR…

• **Black** = gas
• **White** = calcified structures
• **Grey** = soft tissues
• **Slightly darker grey** = fat, i.e. it absorbs slightly fewer x-rays
• **Intense, bright white** = metallic objects
Anatomy on the abdominal x-ray
Take 10 seconds to examine this film...
A SYSTEMATIC APPROACH TO X-RAY INTERPRETATION

1. The right film for the right person
2. Using the “A, B, C, S” system to ensure that the following principles are covered:
   a) Technical details
   b) Interventions
   c) Systematic search for pathology
   d) Abnormal opacities
The right film for the right person

• Is this the right patient?
  – Name
  – DOB
  – Hospital number

• Is this the right film?
  – Date of x-ray
  – Time of x-ray
“A” is for adequacy, alignment and apparatus

Adequate penetration

No rotation

Surgical clips
"B" is for bones

Fractured head and neck of right femur

Classic triad of Paget’s disease

Anteroposterior compression injury to pelvic ring
“C” is for cartilage & joints

- Normal hip joint
- Osteoarthritis in left hip joint
“S” is for soft tissue

Work intraperitoneally to retroperitoneally to evaluate outlines of the major abdominal organs...

• Can you see gas in the stomach and/or bowel?
• Look at size and position of liver and spleen
• Bladder outline may be seen if bladder is full
• Look at size and position of kidneys lateral to T12 to L2 vertebrae
• Is there a clear outline of the psoas shadow?
“S” is for soft tissue

Small bowel obstruction

Small bowel loops > 3 cm

Valvulae conniventes

Loops of bowel are centrally located
“S” is for soft tissue

Large bowel obstruction

Diameter of colon
> 5cm

Haustra

Loops of bowel are located peripherally and follow characteristic pattern
“S” is for soft tissue

Psoas shadow is absent on right side

Left psoas shadow
“S” is for soft tissue

Pneumoperitoneum
“S” is for soft tissue

Check the following structures for calcification:

• Cartilage of ribs
• Blood vessels
• Pancreas
• Kidneys
• RUQ for gallbladder calculi
Systematically interpret this chest x-ray
CLINICAL SCENARIOS
A 30 year-old man with a 6-month history of epigastric pain occurring 2 to 3 hours after meals and anorexia presented to A&E with sudden, severe epigastric pain radiating to his back. Abdominal exam revealed rebound tenderness, guarding and rigidity.

What are the differential diagnoses?

How could this condition be managed?
• An erect chest X-ray showing free gas under the diaphragm is suggestive of a visceral perforation, aka pneumoperitoneum.

• Free gas under the diaphragm is seen in approximately 60% of patients with a perforated peptic ulcer.

• Absence of free gas does not exclude a diagnosis of visceral perforation.
A 70 year-old man presented with periumbilical discomfort and abdominal bloating after meals and fever. Upper GI endoscopy was found to be normal. A barium meal and follow-through study was carried out.

What are the differential diagnoses?

How could this condition be treated?
• This image shows large **diverticulae** of the proximal small bowel with partial intestinal obstruction.

• The incidence of diverticulitis increases with age, with less than 5% before age 40 to greater than 65% by age 85.
A 16 year-old boy presented with a short history of left iliac fossa pain and bloody diarrhoea streaked with mucus. Stool cultures were found to be negative. Flexible sigmoidoscopy showed an acute colitis. Despite being given IV steroids he developed abdominal distension and became systemically unwell.

What are the differential diagnoses?

How could this condition be managed?
• This plain abdominal x-ray was taken shows a **dilated colon** with evidence of mucosal oedema.

• The appearances are those of **toxic dilatation**.

• **TOXIC MEGACOLON** = radiological evidence of colonic dilatation and any of the 3 following conditions: fever, tachycardia, leukocytosis or anaemia.
An 89 year-old woman presented with a 4-day history of absolute constipation and abdominal distension. Examination revealed a grossly distended, non-tender and tympanic abdomen. Sigmoidoscopy showed an empty rectum, and at 25 cm a large amount of faecal fluid and gas was encountered with relief of her symptoms.

What is the differential diagnosis?

How could this condition be managed?
• This plain abdominal X-ray shows the typical features of a sigmoid volvulus, i.e. coffee bean sign.

• Chronic constipation leads to an overloaded sigmoid colonic loop, and the weight of this loaded loop makes it susceptible to torsion along the axis of the mesentery.

• A complete volvulus leads to the development of a closed loop obstruction of the affected colonic segment.
This frail, 85 year-old woman presented with a 6-month history of rectal bleeding, rapid weight loss and change in bowel habit – in particular, increasing constipation. Hepatomegaly and ascites were apparent on abdominal examination. A barium enema revealed this finding.

What are the differential diagnoses?

How could this condition be managed?
• A barium enema showed the presence of 'apple-core' stricture in the proximal sigmoid colon.

• This finding is typical of colonic cancer and can be confirmed by biopsies taken at flexible sigmoidoscopy.

• Increasing age is a well-known risk factor for colorectal cancer.
Summary of systematic approach to AXR interpretation

1. The right film for the right person
2. Using the “A, B, C, S” system to proceed:
   • A = adequacy, alignment, apparatus
   • B = bones
   • C = cartilage and joints
   • S = soft tissue – intraperitoneal → retroperitoneal
Any final questions?

Thank you for your attention.

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