Chapter 115

X-Ray Interpretation *Abdominal*

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CPT Code
Multiple listings based on view ordered

INTRODUCTION

An abdominal x-ray (radiograph) is considered a basic radiological screening tool when evaluating abdominal disorders. It can be ordered as a KUB, flat plate, or 1-view abdomen. If suspicious for free air, order a left lateral decubitus view and chest posteroanterior view. Other, higher technology tools used to evaluate abdominal disorders include computed tomography and magnetic resonance imaging. The ability of the abdominal x-ray to generate high spatial resolution and to visualize various densities within the abdominal cavity can aid in diagnostic evaluation of abdominal disorders but should not be the sole basis for diagnosis. The abdominal x-ray should be correlated with clinical history, physical examination, and additional diagnostic tool results.

OVERVIEW

- Densities
  - Air—DARK
  - Muscles—GRAY
  - Fat—Light GRAY
  - Muscle—Very light GRAY
  - Bones—WHITE
  - Foreign Body—Varies based on density—Coin—DARK
    - Wood splinter—difficult to see
- Inspect the PA view to determine if the x-ray is adequate using **RIPE**
  - **R**otation—Do the clavicles and vertebrae form a cross?
  - **I**nspiration—Are there a minimum of eight ribs visible?
  - **P**enetration—Are the interspaces visible and the thoracic vertebral bodies well defined?
  - **E**xposure—Too much or too little?
- General principles
  - Adequate knowledge of basic anatomy and physiology is necessary for proper interpretation of the abdominal film.
  - An orderly and systematic approach to interpretation of the abdominal film should be used.
  - Small bowel looks like stacked coins and is typically NOT visible on a normal film.
  - Abdominal x-ray red flags (Table 115·1)

RATIONALE

- To obtain visual information about physical anatomy of the abdominal region
- To obtain a visual overview of basic pathophysiology of gastrointestinal, vascular, renal, and skeletal systems of the human organism

INDICATIONS

- Abdominal trauma
- Abdominal pain
- Suspicion of abdominal pathophysiology
- Ingested foreign body

CONTRAINDICATIONS

- Pregnancy (unless shielded)

PROCEDURE

X-Ray Interpretation—Abdominal

Equipment

- X-ray view box or digital viewing program

Procedure

- Place the flat and upright films and left lateral decubitus and chest film (if ordered) on the view box with adequate illumination.
- Inspect for the presence of any foreign bodies in the abdominal cavity.
- Systematically inspect the abdominal region skeletal system.
  - Identify anatomical skeletal landmarks within the abdominal cavity (lumbar, sacrum, and pelvis) (Fig. 115.1).
    - Determine any aberration.
  - Note the absence or presence of demineralization.
  - Note the lack of continuity or symmetry of skeletal structures that may represent fracture, dislocation, metastases (lytic—low density; sclerotic—high

Table 115·1 Abdominal X-ray Red Flags

Free air under the diaphragm
Free air on supine films
Small focal bubbles may be abscess

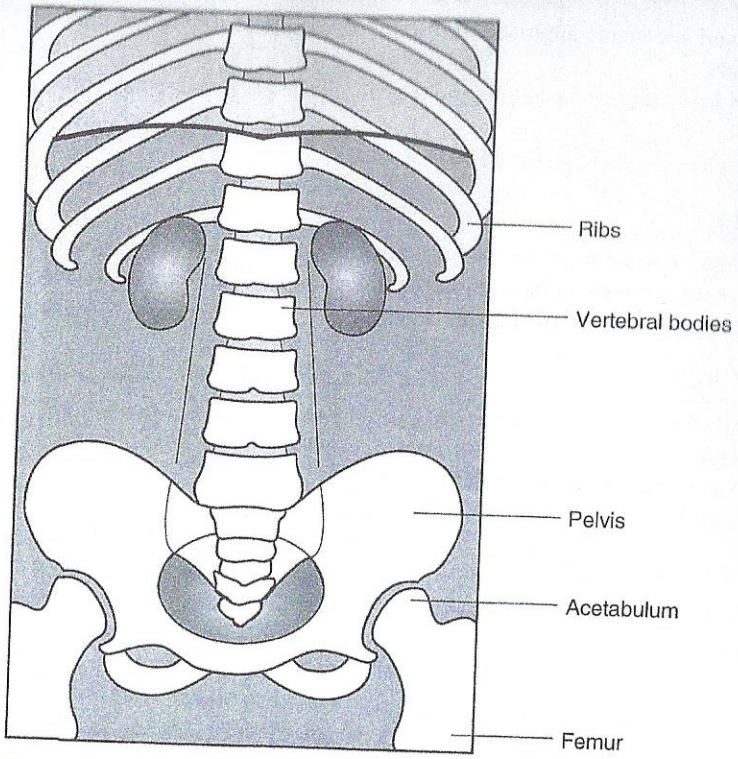


Figure 115.1 Identify anatomical skeletal landmarks of the abdomen.

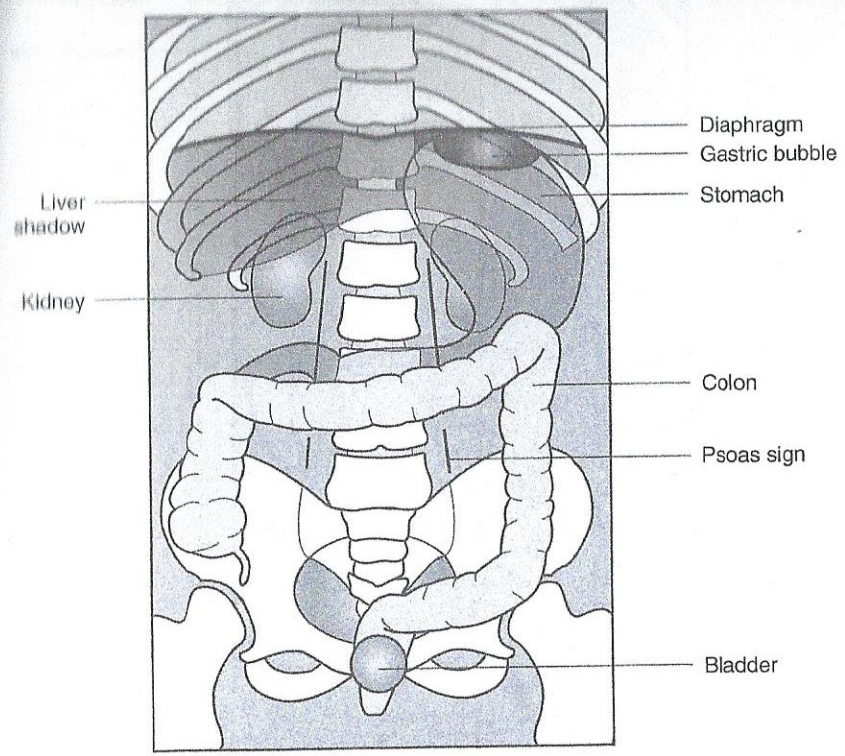


Figure 115.2 Inspect the soft tissues of the abdomen.

density; and mixed), and calcifications of the lumbosacral spine, illiosacral region, pelvis, acetabulum, and femur region.
- Note the presence of pathological calcifications.

- Systematically inspect the soft tissues (Fig. 115.2).
  - Note the presence or absence of the psoas sign.
  - *Diaphragm*—Note the presence or absence of an air and/or fluid pattern under the diaphragm; may indicate abscess.
  - *Liver*
    - Note the homogeneous uniform density of the hepatic shadow.
    - Note the presence or absence of full visualization of hepatic edge.
  - *Spleen*—The splenic shadow generally is hidden by the gastric bubble and splenic flexure of the colon unless splenomegaly is present.
  - *Pancreas*—Usually not visible
  - *Renal*—The entire renal shadow outlines generally are not clearly demarcated. It may be difficult to estimate the overall size of the organs.
  - *Bladder*—If filled, appears as a round homogeneous mass
  - *Uterus*—Usually not visible; however, can present as an irregular mass if fibroids are present.
  - *Vascular*—Note the presence of any calcifications, widening, or tortuosity of the aorta or renal arteries.
  - *Gastrointestinal evaluation*
    - *Stomach*—Note that the gastric shadow with presence of gastric bubble usually is located midline to left upper quadrant region (Fig. 115.3).
    - *Intestines*—Air shadow location is scattered in a random, nonspecific pattern throughout the abdominal cavity.
      - Variables, such as age, amount of air ingested, length of small or large intestine, stool concentration, and pathology can cause normal presentations to appear abnormal and vice versa.
      - Abdominal gas pattern location is generally nonspecific (Fig. 115.4).
      - Abnormal concentration of abdominal gas in one location and/or unilateral appearance of the air gas pattern on one side with the absence of any air on the opposite side may suggest *bowel displacement.*

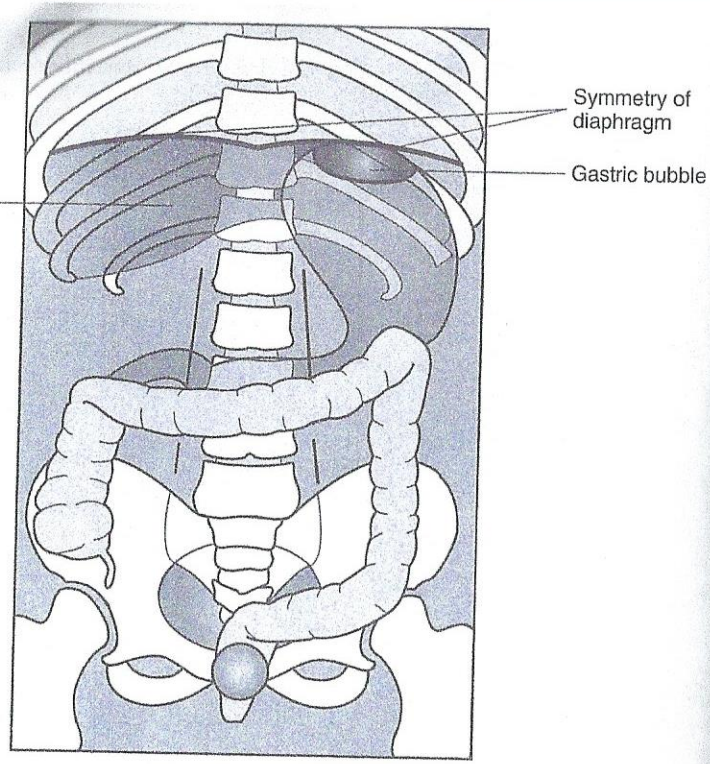
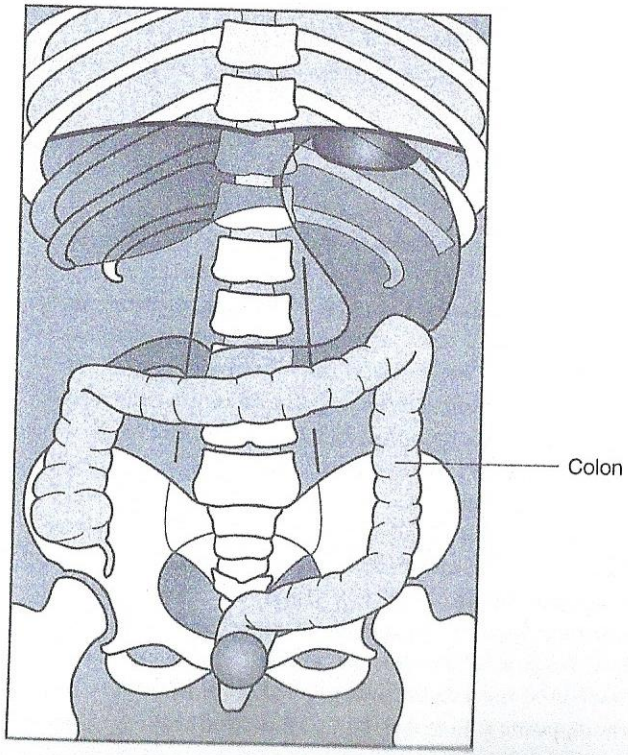


Figure 115.3 Inspect the stomach for location and presence of gastric bubble.



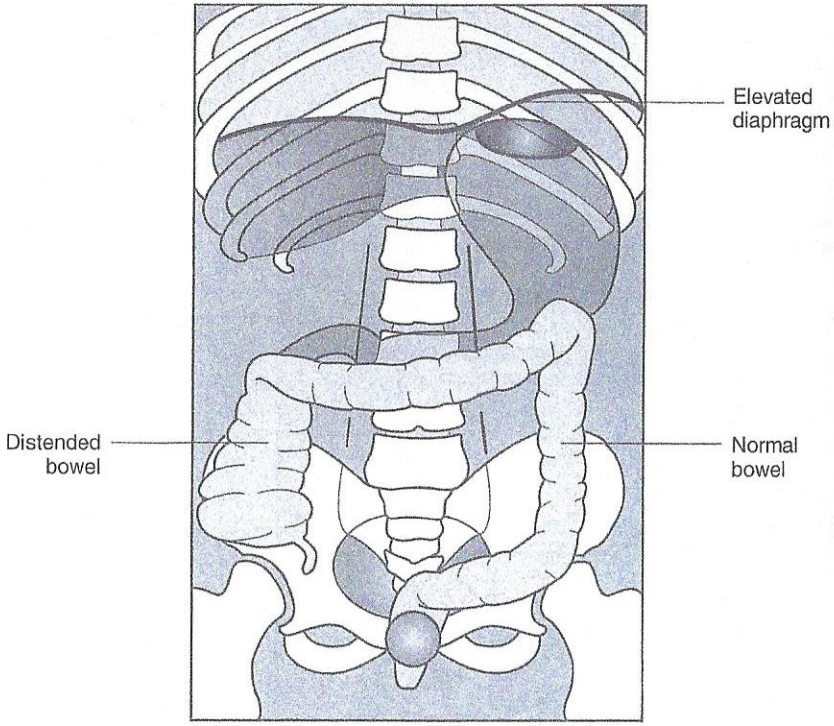


Figure 115.5 Paralytic ileus.

- Location and concentration of air with accompanying dilated bowel proximally and decreased air shadows distally suggest paralytic ileus (Fig. 115.5).
- Localization with the presence of dilated bowel with or without air and/or fluid levels proximally and absence of air shadows distally suggests local obstruction.

- *Peritoneum*
  - Note free air in the peritoneal cavity (pneumoperitoneum) (Fig. 115.6). This is usually caused by the disruption of the abdominal wall.
  - Usually seen with left lateral decubitus and chest posteroanterior views; dark air shadows can be visualized in the diaphragm and against the inferior hepatic margin.
- Inspect for intraperitoneal fluid.
  - Usually obscures hepatic edges.
  - Displaces abdominal gas pattern.

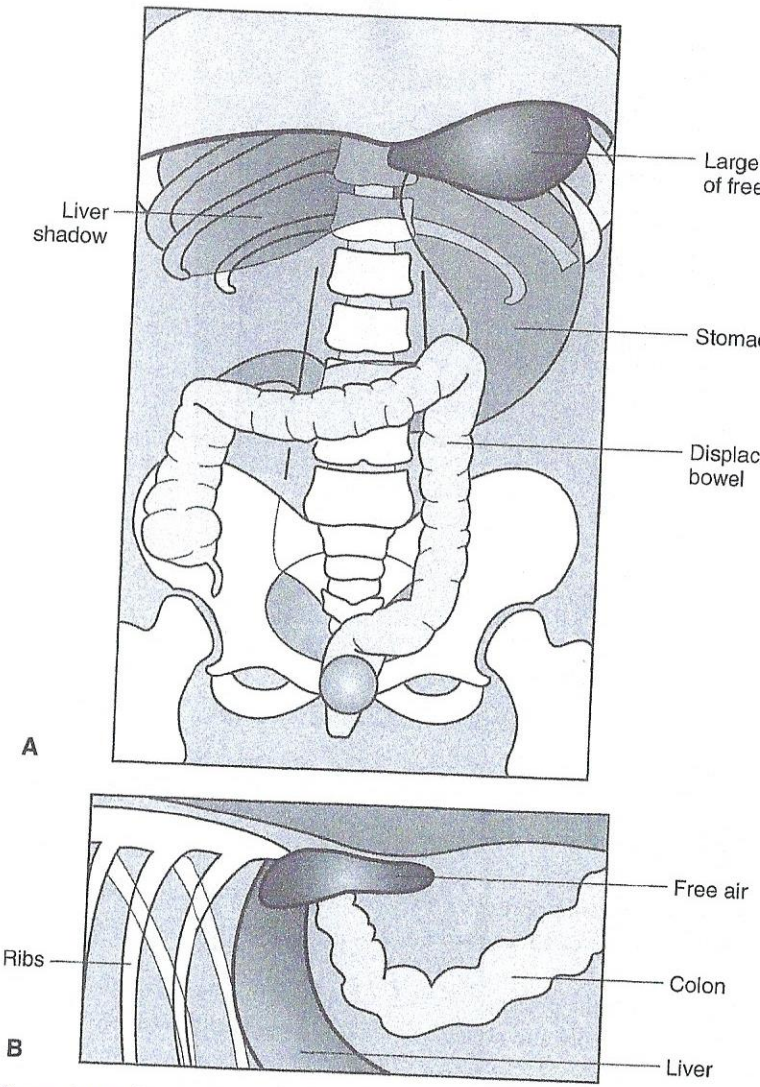


Figure 115.6 Pneumoperitoneum. *(A)* Upright view; *(B)* left lateral decubitus view.

BIBLIOGRAPHY

Barloon T, Weissman A. Diagnostic imaging in the evaluation of blunt abdominal trauma. *Am Fam Physician*. 1996;54(1):205–211.

William EE, Smith WL. *Radiology 101: The Basics and Fundamentals of Imaging*. Philadelphia, PA: Lippincott Williams & Wilkins; 2012.