

## Medical Imaging: Review Questions

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### QUESTIONS

Choose the single best answer for each question.

- Which of the following statements about lumbar spine radiographs is FALSE?**
  - Radiographic evidence of spondylolisthesis in a patient with low back pain requires prompt referral to a back surgeon.
  - The gonadal radiation dose from a lumbar spine film is equivalent to the dose from a daily chest radiograph for 6 years.
  - Patients with radicular low back pain do not absolutely require radiographs.
  - Lumbar spine radiographs are one of the radiologic examinations most often ordered without a clear indication.
  - Oblique views of the lumbar spine should not be routinely ordered.
- What is the preferred imaging study to evaluate for appendicitis?**
  - Ultrasonography
  - Single anteroposterior radiograph of the abdomen
  - Computed tomography (CT) scan
  - Three-way radiography of the abdomen
  - Magnetic resonance imaging
- What is the yearly risk of myocardial infarction or cardiac death among patients with normal results on a myocardial perfusion scan?**
  - Less than 1%
  - Approximately 5%
  - Approximately 10%
  - Between 5% and 10%
  - Variable—the risk is dependent upon clinical factors
- Which of the following statements about chest radiography is FALSE?**
  - On chest radiography, aspiration pneumonia is usually seen in the right middle lobe.
  - The chest radiograph is helpful in the evaluation of abdominal pain.
  - On chest radiography, tracheal shift to the right is a sign of an aortic dissection.
  - Clinical signs of heart failure precede radiographic findings.
  - The chest radiograph is often normal in patients with pulmonary embolism.
- Which of the following conditions cannot be ruled out based on normal radiographic findings?**
  - Fractures of the base of the skull
  - Stress fractures
  - Scaphoid fractures
  - Salter-Harris type I fractures
  - All of the above

*(turn page for answers)*

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#### EXPLANATION OF ANSWERS

1. (A) **Radiographic evidence of spondylolisthesis in a patient with low back pain requires prompt referral to a back surgeon (FALSE).** The presence of spondylolisthesis, even when severe, cannot unequivocally explain the symptoms of low back pain. In general, lumbar spine radiographs should be obtained during an initial visit only in patients older than 50 or younger than 20 years. For patients age 20 to 50 years with acute back pain, radiographs should be obtained only after pain has persisted for more than 2 to 3 months. Because the cause of radicular pain is usually from a herniated disc, a CT or magnetic resonance imaging (MRI) scan is the examination of choice if pain or neurologic deficits persist. A radiograph should be obtained at a first visit only when atypical symptoms or a suspicious clinical history is present. Radiographs are helpful when a concern for infection (eg, in an intravenous drug abuser), metastatic cancer (in an elderly patient), or abdominal aneurysm (in an elderly patient) exists, or in cases of severe trauma. Children present a challenge when deciding whether to order lumbar radiographs because the gonadal radiation dose is high. The gonadal exposure is estimated to be equivalent to the exposure from a daily chest radiograph for a minimum of 6 years, and some estimates range up to 98 years. Oblique views rarely are helpful, and most subtle osseous changes seen on these views are considered insignificant. Lumbar spine films are often unnecessary; they deliver a large radiation dose to the patient and increase costs significantly. Some radiologists believe that lumbar films are among the most overused examinations in radiology.
2. (C) **Computed tomography (CT) scan.** Recent research has shown that abdominal CT scan is the preferred imaging study to evaluate possible appendicitis. A recent study demonstrated an overall accuracy of 98% with no false-negative results in routine CT scanning of patients admitted for suspected appendicitis. In the past, an ultrasound examination was considered the best choice, but now the abdominal CT scan is accepted as superior.
3. (A) **Less than 1%.** The rate of hard cardiac events (myocardial infarction or cardiac death) among patients with a normal myocardial perfusion scan has been shown to be less than 1% per year in several large studies. This favorable prognosis has been demonstrated in patients with several different risk factors. To achieve this low rate, computerized quantification of the scans is necessary in addition to the physician's qualitative interpretation. Scans determined to be normal by qualitative analysis alone have a higher association with cardiac events of approximately 5% per year.
4. (D) **Clinical signs of heart failure precede radiographic findings (FALSE).** Radiographic findings precede the clinical signs of heart failure. Early radiographic signs include peribronchial cuffing, perihilar haze, and upper lobe blood diversion. In patients with aspiration pneumonia, however, the initial chest radiograph may be normal because radiographic signs follow the clinical signs of aspiration pneumonia. When clinical signs develop, a radiographic sign to look for is the silhouette sign over the right heart border. The chest radiograph may help to evaluate abdominal pain because it demonstrates both free air under the diaphragm and lower lobe pneumonia, which may cause abdominal pain. Because of the high mortality caused by aortic dissections, subtle findings on the chest radiograph must be noted quickly and the patient referred immediately for a chest CT, aortic arteriography, or transesophageal echocardiography. In addition to looking for a widened mediastinum (> 8 cm), physicians should look for depression of the left main bronchus, blurring of the aortic outline, a tracheal shift to the right, and obliteration of the medial aspect of the upper left lobe. A normal chest radiograph does not rule out pulmonary embolism. However, a pleural effusion, wedge-shaped shadows caused by lung infarction, or a raised hemidiaphragm are occasionally demonstrated.
5. (E) **All of the above.** It is important to treat the patient, not the radiograph. Several fractures are not identified very well on plain radiographs, including base of skull, stress, and certain epiphyseal fractures. Especially in children, a small greenstick fracture may not be seen on initial radiograph; therefore, a repeat radiograph in 1 week is required. Scaphoid injuries are especially important to diagnose because these injuries can result in bone necrosis. The scaphoid is particularly vulnerable to vascular disruption and necrosis because its blood supply comes from an artery with distal-to-proximal flow instead of normal proximal-to-distal flow.

#### SUGGESTED READING

- Goodman LR, Felson B: *Felson's Principles of Chest Roentgenology: A Programmed Text*, 2nd ed. Philadelphia: WB Saunders, 1999.
- Helms CA: *Fundamentals of Skeletal Radiology*, 2nd ed. Philadelphia: WB Saunders, 1994.
- Rao PM, Rhea JT, Novelline RA, et al: Effect of computed tomography of the appendix on treatment of patients and use of hospital resources. *N Engl J Med* 1998;338:141-146.