

# EMERGENCY IMAGING

Keith D. Hentel, MD

FIGURE 1



FIGURE 2



A 55-year-old man presents to the emergency department with acute shortness of breath and a history of increasing leg pain and swelling. On physical examination, the patient is tachycardic, and pulse oximetry shows low oxygenation. A radiograph and subsequent CT of the chest and lower extremities are ordered to evaluate for possible pulmonary embolus and/or deep vein thrombosis. The chest radiograph (Figure 1) and the scout image from the CT of the legs (Figure 2) are shown.

**What is your diagnosis?**

**What do you expect the chest CT to demonstrate?**

**Dr. Hentel**, editor of "Emergency Imaging," is an associate professor of clinical radiology at Weill Cornell Medical College in New York City. He is also chief of emergency/musculoskeletal imaging and the vice-chairman for clinical operations for the department of radiology at NewYork-Presbyterian Hospital/Weill Cornell Medical Center in New York City. He is a member of the EMERGENCY MEDICINE editorial board.

CONTINUED

## ANSWER

FIGURE 3

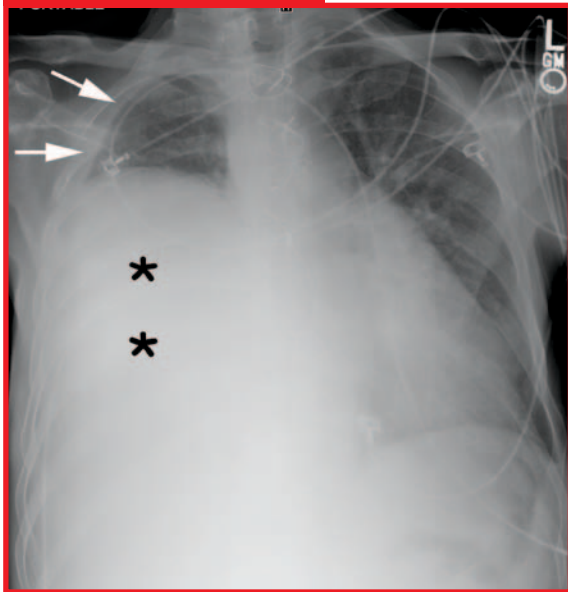
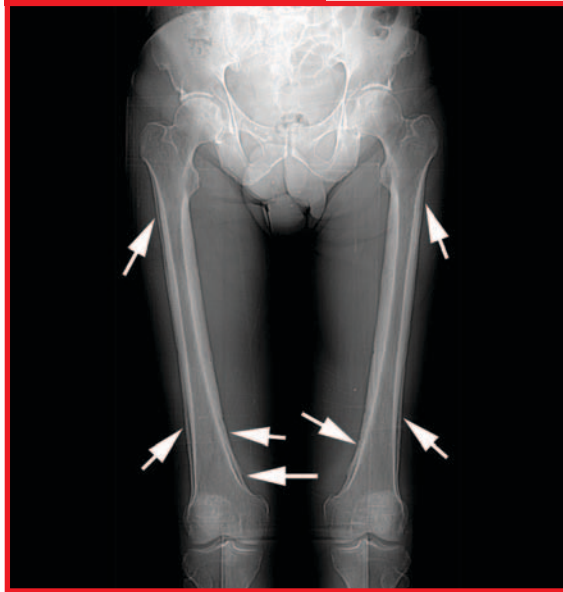


FIGURE 4



The chest radiograph (Figure 3) shows marked increased opacity in the right hemithorax (black asterisks). This opacity is nonspecific, although there is the suggestion that at least some of the opacity is caused by pleural effusion, as fluid is seen tracking laterally (white arrows). In Figure 4, the scout image from the CT venogram of the legs, diffuse periosteal reaction of both femurs is present (white arrows).

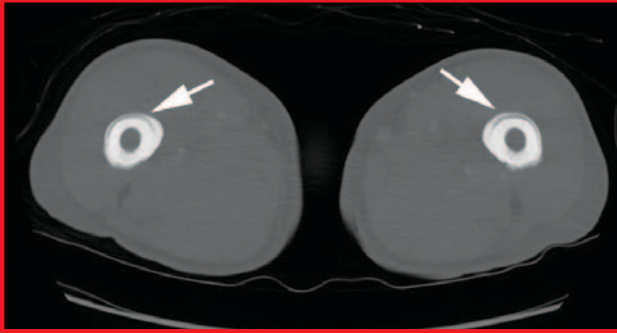
Periosteal reaction, seen on radiographs as new bone formation surrounding the cortex, is a nonspecific finding that can occur with any insult or inflammation of the periosteum. In the adult patient, etiologies include injury, inflammatory arthritis, infection, and use of certain medications. Bone tumors, both benign and malignant, may cause periosteal reaction as well.<sup>1</sup> However, when the periosteal reaction is diffuse and bilateral—as demonstrated in this patient's axial CT of the legs (white arrows, Figure 5)—the differential diagnosis can be considerably narrowed to metabolic disease, such as hypertrophic osteoarthropathy or thyroid acropachy, and congenital disorders of the periosteum, such as pachydermoperiostosis.

Hypertrophic osteoarthropathy (HOA) is char-

acterized by diffuse periosteal reaction of the long bones in a bilateral symmetric pattern and is typically associated with clubbing of the digits. While a primary form of this disorder does exist, most cases are secondary and related to a wide range of neoplastic and nonneoplastic conditions. Such conditions include a broad span of primary malignancies and benign disorders: lung disease (eg, cystic fibrosis, idiopathic pulmonary fibrosis, empyema), rheumatologic disorders (eg, rheumatoid arthritis, seronegative spondyloarthropathies, systemic lupus erythematosus, vasculitis), and gastrointestinal disorders (eg, inflammatory bowel disease, biliary cirrhosis).<sup>1-3</sup> However, up to 80% of cases are secondary to primary or metastatic lung cancer, and HOA has been reported in 4% to 32% of cases of primary lung cancer.<sup>3</sup> Hence, HOA is also traditionally known as *hypertrophic pulmonary osteoarthropathy*.

Whenever diffuse periosteal reaction is identified, evaluation of the chest should be performed, as a tumor will often be detected. In this patient, an axial CT image of the chest (Figure 6) revealed that the opacity seen on radiography in the right

**FIGURE 5**



**FIGURE 6**



hemithorax was due to the presence of a large pleural-based mass (red arrows). A small pleural effusion (red asterisk) is present as well.

HOA may resolve with the correction or resection of the underlying disorder. Treatment with anti-inflammatory agents and bisphosphonates has been reported for pain control.<sup>3</sup> **EM**

## REFERENCES

1. Rana RS, Wu JS, Eisenberg RL. Periosteal reaction. *AJR Am J Roentgenol.* 2009;193(4):W259-W272.
2. Armstrong DJ, McCausland MA, Wright GD. Hypertrophic pulmonary osteoarthropathy (HPOA) (Pierre Marie-Bamberger syndrome): two cases presenting as acute inflammatory arthritis. Description and review of the literature. *Rheumatol Int.* 2007;27(4):399-402.
3. Yao Q, Altman RD, Brahn E. Periostitis and hypertrophic pulmonary osteoarthropathy: report of 2 cases and review of the literature. *Semin Arthritis Rheum.* 2009;38(6):458-466.