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Medical imaging quiz – Case 70

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A 15-year-old male patient was referred to the Radiology Department for a computed tomography (CT)-guided percutaneous biopsy of a lytic lesion of the right acetabulum (fig. 1). Main symptom was pain during exercise for at least 2 months. CT-guided biopsy was performed and confirmed the diagnosis.

Comments

Osteosarcomas are the second most common primary bone tumor, malignant bone-forming tumors. They can be classified into primary and secondary forms, as well as histologic types, of which conventional osteosarcoma is the most common.

Primary osteosarcoma typically occurs in young patients (10–20 years) with 75% taking place before the age of 20, because the growth centers of the bone are more active during puberty/adolescence. There is a slight male predominance. Secondary osteosarcoma occurs in the elderly, usually secondary to malignant degeneration of Paget disease, extensive bone infarcts, post-radiotherapy for other conditions, osteochondroma, and osteoblastoma.

The diagnosis of osteosarcoma is based on a combination of typical radiographic and pathological features. Diagnostic criteria according to the World Health Organization (WHO) classification of bone tumors imaging features of a bone tumor (osteoid matrix with neoplastic bone formation and permeative, destructive growth pattern).

Histological criteria are high-grade atypia of tumor cells, frequent atypical mitotic figures.

Clinical and imaging-related characteristics indicating the diagnosis without the pathological information are bimodal age distribution in adolescents (10–20 years) and in elderly patients bone tumor with osteoid matrix, permeative growth and non-expansile cortical destruction location in a metaphyseal-diaphyseal region with epiphyseal extension. Patients often present with bone pain, occasionally accompanied by a soft-tissue mass or swelling. At times, the first symptoms are related to pathologic fracture.

Primary osteosarcomas typically occur at the metadiaphysis of long bones in the appendicular skeleton, most commonly at the following sites: femur: approximately 40% (especially distal femur), tibia: approximately 16% (especially proximal tibia), humerus: approximately 15%. Osteosarcomas can be further categorized by anatomic relationship to the bone as intramedullary/central: approximately 80%, surface: approximately 10–15%, extraskeletal osteosarcoma: approximately 5%. High-grade osteosarcomas may occasionally present with skip metastases.

Osteosarcomas are bulky tumors where a heterogeneous cut

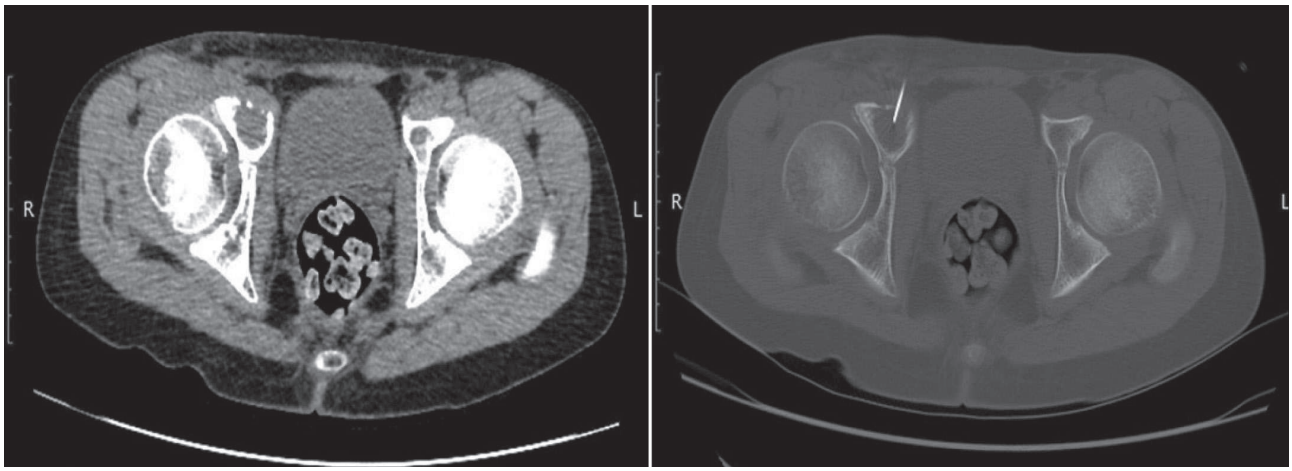

Figure 1. Computed tomography (CT) reveals an osteolytic lesion with a defined sclerotic transition zone of the right acetabulum.

surface demonstrates areas of hemorrhage, fibrosis, and cystic degeneration. Their extension within the medullary cavity is often much more extensive than the bulky part of the tumor would suggest. Areas of bone formation are characteristic of osteosarcomas, with the degree of bone formation varying widely.

Conventional radiography continues to play an important role in diagnosis. Typical appearances of conventional high-grade osteosarcoma include: medullary and cortical bone destruction wide zone of transition, permeative or moth-eaten appearance, aggressive periosteal reaction sunburst type, Codman triangle, lamellated (onion skin) reaction, soft-tissue mass, tumor matrix ossification/calcification.

The role of CT is predominantly utilized in assisting biopsy and staging. CT adds little to plain radiography and magnetic resonance imaging (MRI) in the direct assessment of the tumor. The exception to this rule is predominantly lytic lesions in which small amounts of mineralized material may be inapparent on both plain film and MRI. Chest CT and bone scanning have a role in distant staging.

MRI is proving an essential tool to determine accurate local staging and assessment for limb-sparing resection, particularly for evaluation of intraosseous tumor extension and soft-tissue involvement. Evaluation of the growth plate is also essential as up to 75–88% of metaphyseal tumors do cross the growth plate into the epiphysis.

Cure, if achievable, requires aggressive surgical resection often with amputation followed by chemotherapy. If a limb-salvage procedure is feasible, a course of multidrug chemotherapy precedes surgery to downstage the tumor, followed by wide resection of the bone and insertion of an endoprosthesis. The outcome depends on different factors such as age, sex, site, size, and type, but the most important predictor is the histologic degree of necrosis post-induction chemotherapy; 90% histologic necrosis is associated with much better prognosis. Currently, the 5-year survival rate after adequate therapy is approximately 60–80%.

The most frequent complications of conventional osteosarcoma include a pathologic fracture and the development of metastatic disease, particularly to the bone, lung, and regional lymph nodes.

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