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Medical Imaging Quiz – Case 14

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An 80-year-old female patient presented with low grade fever lasting for 3 months along with localized pain in her left elbow. Past history of the patient had iron deficiency anemia, diabetes mellitus and arterial hypertension, all well controlled with medication and diet. The complete blood count showed slight iron deficiency anemia and an ESR of 47 (N: 0–20). The rest of the biochemical tests' results were within normal range, with a small increase in patient's LDH (370 IU/L, N: 120–230 IU/L).

Initially, a lateral radiograph of the patient's left humerus revealed a mottled appearance of the distal third of the bone (fig. 1). Following that, CT and magnetic resonance imaging (MRI) scans of the corresponding elbow were performed. CT scan of the left elbow showed a periosteal soft tissue mass surrounding the distal part of the left humerus and the left elbow joint, which was enhanced after the use of contrast media. Mild trabeculation with sclerotic and lytic changes of the distal third of the humeral bone with focal cortical thickening without any obvious lytic areas were also demonstrated (fig. 2). MR imaging revealed abnormal marrow attenuation signal intensity in the distal left humerus. No cortical bone lytic changers were detected. A periosteal soft tissue mass/edema was detected in the distal humerus extending to her left elbow joint (fig. 3). Thoracic CT scan revealed pathologic appearance of both her 9th ribs posteriorly, with mixed lytic and sclerotic changes. Additionally there was a pathologic soft tissue mass in her right side protruding partly into her right hemithorax and posteriorly in her right back. All the above suggested the presence of secondary focuses. No space occupying lesion was detected in her lung parenchyma and mediastinum. Mediastinal lymph nodes were not detected. Abdominal lymph nodes were not revealed at the abdominal CT scan. Thoracolumbar spine MRI scan detected infiltrates in her lower thoracic and lumbar spine. Those infiltrates were accompanied by paraspinal dense tissue mass that extended into the corresponding subdural space at the level of 7th to 9th thoracic vertebrae and between 12th thoracic and 1st lumbar vertebra. Compression of the spinal column was detected at the level of 8th to 9th thoracic vertebrae (fig. 4). Definite diagnosis

Figure 1. X-ray reveals a mottled appearance of the distal third of the left humerus.

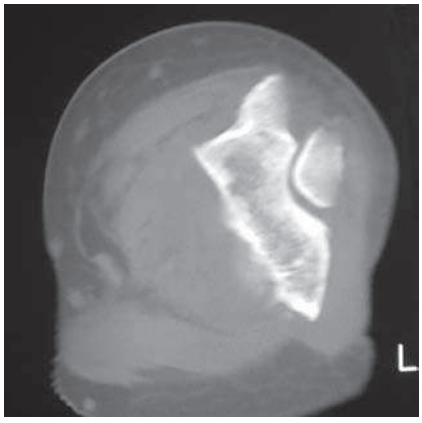

Figure 2. CT scan shows mild trabeculation with sclerotic and lytic changes of the distal third of the humeral bone with focal cortical thickening.

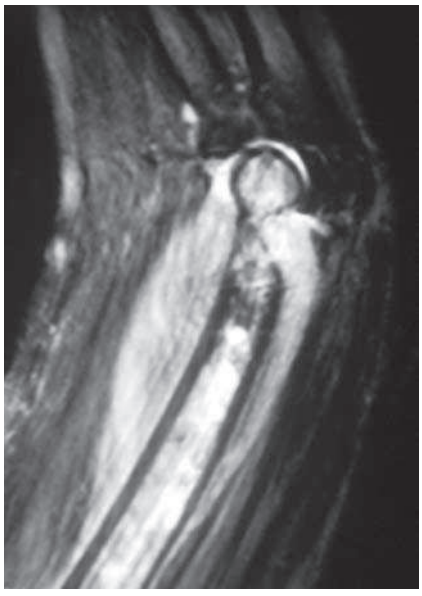

Figure 3. MRI demonstrating a periosteal soft tissue mass/edema in the distal humerus extending to the left elbow joint with a small fluid collection intraarticularly.

was confirmed by the biopsy specimens taken from the lesion in her left elbow.

Comment

Lymphomas that originate from bones are quite rare and account for 1–3% of all primary bone tumors and 5% of extranodal lymphomas. Most cases of primary bone lymphoma (PBL) result from non-Hodgkin lymphomas. Diagnostic criteria, adopted by WHO, include (a) a primary focus in a single bone, (b) histological confirmation and (c) no evidence of diagnosis of distant soft tissue or distant lymph node involvement. Regional lymph node involvement at the time of diagnosis is not considered exclusionary using these criteria. Currently, it is accepted that PBL may involve multiple bones as long as the other two criteria are met.

After the diagnosis of lymphoma is confirmed by biopsy of the bone lesion, CT examination of the chest, abdomen and pelvis is needed, to exclude a primary soft tissue origin of the tumor or distant disease. Once soft tissue origin and distant disease are excluded, MRI is the preferred way to determine the tumor stage in the affected bone.

The bones that are usually involved are those that contain red marrow. Common sites in decreasing frequency are the femur –especially the metadiaphysis–, humerus, tibia, vertebral column, pelvis, sternum, ribs and the skull.

Main symptoms include prolonged intermittent bone pain, present for months if not years, local swelling and palpable mass (the area of the involved tumor may be tender or swelled), and systemic symptoms such as fever and weight loss. Vertebral involvement can cause reticular symptoms and can even lead to spinal cord compression signs.

Figure 4. MRI scan detected infiltrates in the lower thoracic and lumbar spine.

Radiographic appearance of PBL is variable. Certain radiographic patterns have been identified in those cases that have been histologically proved to be PBL, but the radiographic patterns are not pathognomic of PBL and a definite diagnosis cannot be made on the basis of the initial radiograph alone. These patterns are demonstrable on either CT or MRI scans.

On the initial CT scan, the pattern of the bone destruction (osteolytic, mixed or sclerotic), the type of osteolysis, as well as the precise size of osteolytic cortical and marrow cavity destruction are evaluated. The tumor is enhanced after contrast-enhanced scans. Initial CT examination is considered the gold standard in thoraco-abdominal staging of the disease. On follow-up CT scans, the changes of bone morphology, the correct anatomic shape, the volume of the affected bone, the presence of new bone formation are assessed [(i) unstructured; no differentiation of cortex and trabecular bone, and (ii) structured; cortex and trabecular bone present] and the extraosseous soft tissue invasion. All these findings are then compared with MRI scans. All lesions are accessed for homogeneity or heterogeneity of T_1- and T_2-weighted signals. Signal intensities are graded as hypo-, iso-, or hyper-intense relative to skeletal muscle on both sequence types. The pattern of contrast enhancement is graded as homogeneous or heterogeneous. Based on clinical, radiological and histological data, dynamic contrast enhanced MRI has a 90% sensitivity and a 80% specificity.

As mentioned above, both CT and MRI are highly sensitive for detection of the skeletal lesions but lack in specificity. However, they both provide a good assessment of bone texture and the relation between bone lesions and their adjacent structures, such as soft tissue and bone marrow, thus allowing for accurate determination of the extent of the tumor.

In summary, PBL must be included in the differential diagnosis in cases of bones with aggressive pattern of lytic bone destruction. CT and MR imaging findings can be an important diagnostic tool for identifying PLB, especially when a large soft-tissue mass around the lesion with possible bone expansion and abnormal marrow attenuation are seen.

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