Diffuse large B-cell lymphoma of the femur with extensive involvement of adjacent soft tissues

Clinical History:

A 79-year-old woman, with diabetes mellitus and hypertension, came to our unit for complaints of right knee pain, extending towards the leg, which had been persistent for 5 months and unresponsive to analgesics. Physical examination detected right leg swelling with limited flexion-extension. Laboratory tests revealed lactate-dehydrogenase, fibrinogen and WBC count increments.
Imaging Findings:

Ultrasound examination displayed: conspicuous right knee effusion involving superior recesses; synovial hypertrophy; hypoechoic mass in the middle-distal region of femur, displacing the middle, medial and lateral vast. Femur X-ray showed: macular dishomogeneous structure of distal region, resulting from osteolytic lesions; cortical erosions of distal metaphyseal external surface.

CT scan, beside confirming radiographic findings, showed also: decalcification of medullary bone matrix; periosteal bone spicules protruding towards soft tissues; femur surrounded by muscular isodense masses with regular margins; vastus medialis swelling without densitometric alterations.

MRI, performed for suspected secondary lesion, displayed: diffuse femoral lesions (T1-hypointense/T2-hyperintense), invadeing periosseous soft tissues.

Following CT-guided biopsy, the diagnosis of diffuse large B-cell non-Hodgkin's lymphoma (NHL) was made.

Whole-body CT staging revealed: multiple lung nodules (up to 4-cm diameter), compatible with metastases; several focal splenic hypodense lesions (from few mm to 2-cm diameter); involvement of mesenterial, right iliac, inguinal and femoral lymph nodes (up to 2.7-cm maximum diameter).

Discussion:

Primary bone lymphoma is uncommon and affects mostly the metaphysis/diaphysis of long bones (usually femur). It occurs mainly in adult/elderly population, and its commonest histological phenotype consists of diffuse large B-cells. Clinical features include: localized or migrating pain and, less frequently, soft tissue swelling, palpable mass, pathological fractures and systemic “B” symptoms (Ann Arbor classification). In cases of disseminated disease, secondary bone involvement is difficult to distinguish from primary one, with radiological features being similar.

Radiological appearance of bone lymphoma is nonspecific and heterogeneous, making difficult the initial diagnosis. Usually, it appears as isolated or multiple radiolucent osteolytic lesions, often with sclerosis and poorly defined margins, characterized by permeative or moth-eaten pattern, corresponding to marrow and cortical replacement by lymphoma. Cortical destruction or erosion with soft tissue invasion is frequent and regarded as negative prognostic factor.

Bone scintigraphy appearances are also nonspecific, as lymphomatous lesions show a central area of decreased uptake, with increments at periphery.

CT is useful for: studying bone lesions; defining cortical destruction; evaluating soft tissue and marrow involvement; staging (evidence of local or distant dissemination).

MR allows local staging better than other techniques, particularly with regard to bone marrow and soft tissue involvement. MR signal intensity of bone lymphoma is dishomogeneous: isointense/hypointense to muscle on T1; hypo/iso/hyperintense to subcutaneous fat on T2; hypointense on T1/T2 for conspicuous fibrosis. Fast tumor growth with deficient vascular supply promotes necrotic areas, contributing to heterogeneity of signal intensity.

Lymphomatous bone marrow is detected as a low signal on T1, due to fat replacement, in contrast with hyperintense normal marrow. Soft tissue involvement appears as isointense to muscle on T1 and hyperintense on T2, with diffuse enhancement. Short tau inversion-recovery (STIR) fat suppression sequences yield signal enhancement on T1 and T2.

PET scan is helpful in staging, and is superior to CT or MR in assessing remission.

Differential diagnosis includes: Ewing’s sarcoma, osteosarcoma, metastasis, osteomyelitis, multiple myeloma, and leukemic infiltrate. Only bone biopsy allows a correct diagnosis by immuno-histochemical analysis.

In the present case, the systemic dissemination of disease does not allow to discriminate between primary or secondary bone lymphoma. However, the extensive involvement of bone and adjacent tissues by lymphomatous lesion, together with the femoral location and histopathological diagnosis of diffuse large B-cell NHL, suggests a primary skeletal form. Whatever the origin, it is crucial for the radiologist to recognize lymphoma, despite its heterogeneous appearances, to allow timely and adequate therapeutic measures.
**Differential Diagnosis List:** Diffuse large B-cell lymphoma of the femur., Ewing's sarcoma, Osteosarcoma, Metastasis, Osteomyelitis, Multiple myeloma, Leukaemic infiltrate

**Final Diagnosis:** Diffuse large B-cell lymphoma of the femur.

**References:**


Figure 1

Description: Conspicuous right knee effusion involving superior recesses; synovial hypertrophy; hypoechoic mass in the middle-distal region of femur, displacing the middle, medial and lateral vast.

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Description: Macular dishomogeneous structure of the femoral distal region, resulting from osteolytic lesions. Cortical erosions of the distal metaphyseal external surface. Origin:
Figure 3

Description: T1 hypointense diffuse lesions in the middle and distal region of the femur, with medullar and cortical involvement. Origin:
Description: T2 hyperintense diffuse lesions in the middle and distal femur, with medullar and cortical involvement. The extension towards the soft tissues is best resolved on T2 sequence, allowing better detection of periosteal and cortical lesions. Origin:
Description: Newly formed tissue, surrounding the femur, displays low signal interrupted by high-signal areas on T2. Origin:
Description: Short tau inversion-recovery (STIR) fat suppression sequences yield signal enhancement on T1 and T2. Origin:
**Description:** CT-guided biopsy of the pathologic tissue by antero-lateral access. **Origin:**

**Description:** Standard histological analysis (ematoxilin-eosin staining; E.E.) and immunohistochemical evaluation of CD20 and Ki67. **Origin:**
Figure 5

Description: Right leg swelling with extensive antero-lateral hyperaemia. Origin:
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**Figure 6**

**a**

Description: Multiple lung nodules (up to 4-cm diameter) compatible with metastases.

**b**

Description: Multiple lung nodules (up to 4-cm diameter) compatible with metastases.
Description: A lung nodule involving the right hilum. Origin:

Description: Several focal splenic hypodense lesions (from few mm to 2-cm diameter), compatible with metastases. Origin:
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Description: Involvement of right iliac chain lymph nodes (up to 2.7-cm maximum diameter). Origin:
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