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(CASE REPORT)

Primary bone lymphoma: Case report and review of the literature

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Abstract

Primary bone lymphoma (PBL) is a rare extra nodal manifestation of non-Hodgkin lymphoma, representing less than 5% of primary bone tumors. Diffuse large B-cell lymphoma (DLBCL) is the predominant histologic subtype, whereas indolent variants, including follicular lymphoma, are infrequently reported.

We present three cases of PBL, each illustrating distinct clinical, radiological, and pathological features. The first patient, a 54-year-old woman, presented with progressive left knee pain and swelling. Imaging revealed an extensive osteolytic lesion in the distal femur with soft tissue extension. Histopathology confirmed DLBCL of the germinal center B-cell (GCB) subtype.

The second case involved a 54-year-old man with chronic bilateral iliac pain. Pelvic CT demonstrated well-circumscribed osteosclerotic lesions in both iliac wings. Biopsy and immunohistochemistry confirmed primary bone follicular lymphoma, an indolent and rare PBL subtype.

The third patient, a 39-year-old woman, presented with recurrent right-sided basi-thoracic pain. Imaging identified a solitary osteolytic lesion in the posterior aspect of the sixth rib. Histopathology confirmed DLBCL.

These cases emphasize the heterogeneity of PBL presentations, highlight the critical role of early biopsy for accurate diagnosis, and illustrate the value of a multidisciplinary approach in patient management.

Keywords: Primary bone lymphoma; DLBCL; Follicular lymphoma; Osteolytic lesions

1. Introduction

Primary bone lymphoma (PBL) is an uncommon malignancy of the skeletal system, accounting for a small proportion of primary bone tumors (<5%) and approximately 3–5% of extra nodal non-Hodgkin lymphomas (1,2). At diagnosis, the disease is typically confined to bone, without detectable systemic involvement (3). Among histological subtypes, diffuse large B-cell lymphoma (DLBCL) predominates, while indolent variants, such as follicular lymphoma, are exceedingly rare and poorly characterized (4,5).

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Clinically, PBL often presents with localized pain, swelling, or a palpable mass. Systemic "B" symptoms, including fever, night sweats, and weight loss, are uncommon (6). Radiologically,lesions are usually osteolytic with variable cortical destruction and occasional soft tissue extension, making differentiation from other benign or malignant bone lesions challenging. Histopathological confirmation remains essential for definitive diagnosis (7).

Given the rarity and diverse presentation of PBL, accurate diagnosis is often delayed. This report presents three patients with distinct clinical, radiological, and pathological findings, illustrating the heterogeneity of PBL and the necessity of a multidisciplinary approach to management.

2. Case presentation

2.1. Case 1

A 54-year-old woman, married with four children, presented with a two-month history of progressive left knee pain and swelling. She reported increasing difficulty ambulating, eventually necessitating wheelchair use. She denied systemic symptoms, including fever, night sweats, or weight loss. Her medical history was notable for a suspected ischemic stroke, although no documentation was available.

On physical examination, a firm, non-tender swelling was noted over the left knee, without erythema or local warmth. There was no peripheral lymphadenopathy or hepatosplenomegaly.

Neurological and cardiovascular examinations were unremarkable. Laboratory studies demonstrated mild anemia (hemoglobin 12.3 g/dL), thrombocytopenia (103×10^9/L), leukopenia (3.75×10^9/L), and an elevated erythrocyte sedimentation rate (79 mm/h). Serum lactate dehydrogenase (LDH) was elevated at 395 U/L, while renal and liver function tests were normal. Serological testing for hepatitis B and syphilis was negative.

Imaging with CT and MRI of the left knee revealed a large osteolytic lesion involving the distal femur and extending into the proximal tibia, with cortical disruption and extension into the surrounding soft tissues. A CT-guided bone biopsy was performed, and histopathological examination demonstrated diffuse infiltration by large atypical lymphoid cells.

Immunohistochemistry was positive for CD20 and showed a high Ki-67 proliferation index, consistent with diffuse large B-cell lymphoma (DLBCL), germinal center B-cell (GCB) subtype. The patient was subsequently referred to oncology for staging and initiation of systemic chemotherapy.

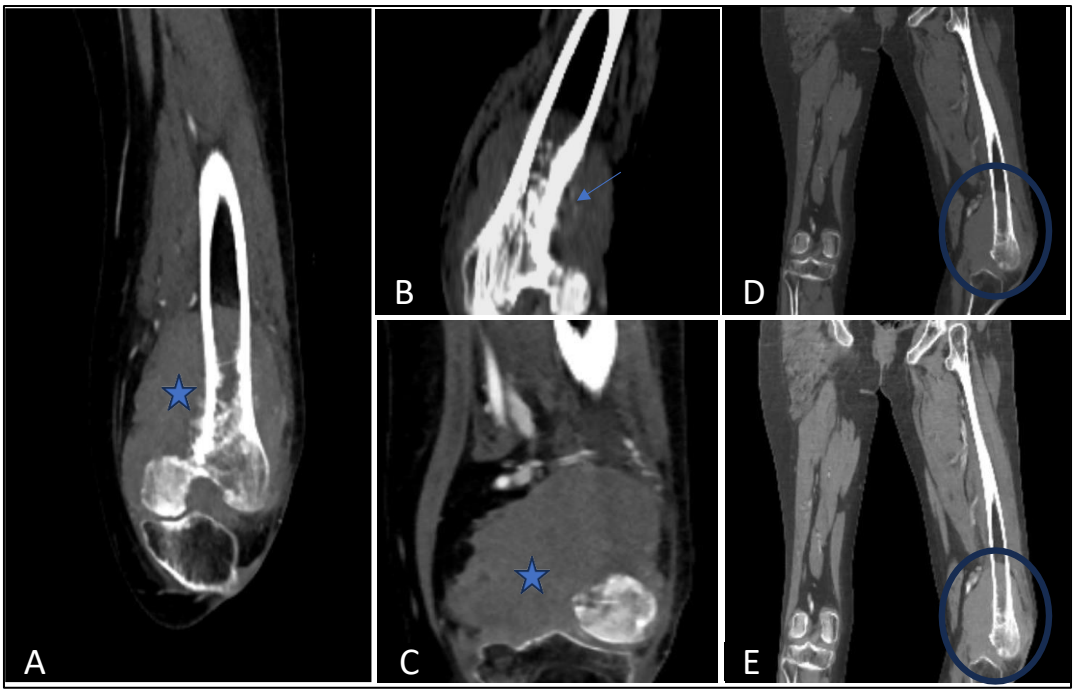

Figure 1 Coronal (A, D, E) and sagittal (B, C) CT images of the left distal femur show a soft-tissue osteolytic lesion centered on the distal metaphyseal–epiphyseal region, causing focal cortical destruction, with endomedullary extension and involvement of the ipsilateral femorotibial joint

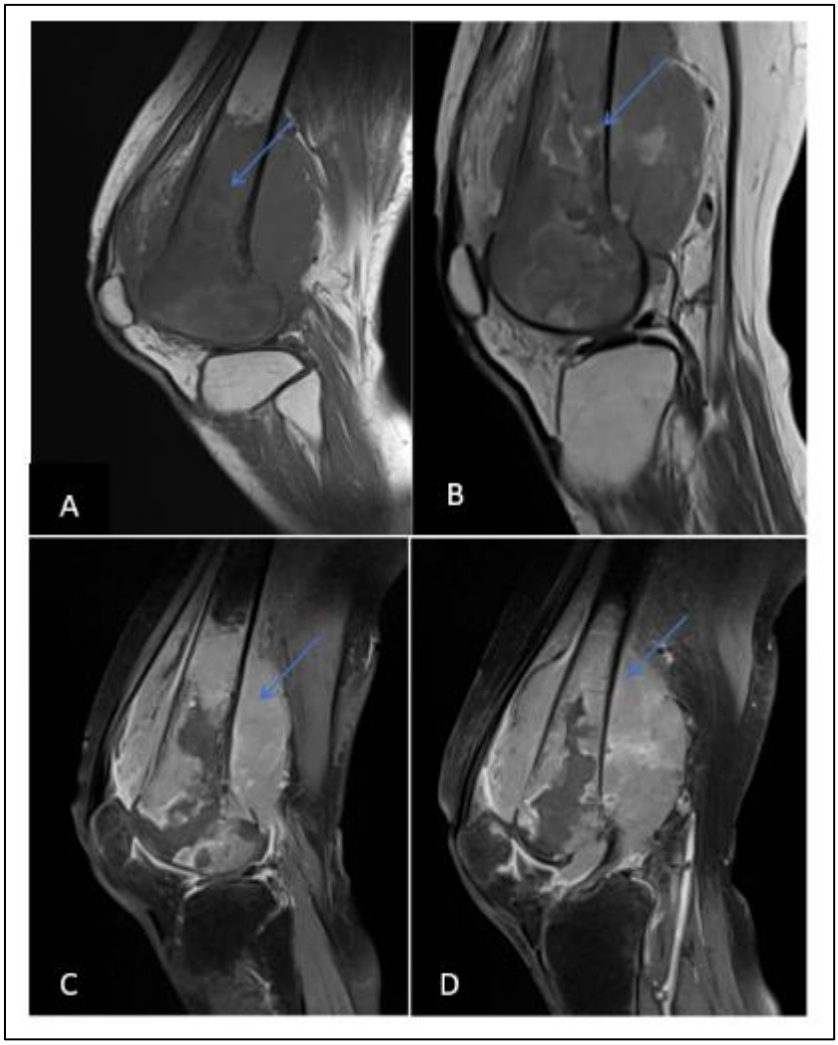

Figure 2 MRI of the left distal femur, including sagittal T1-weighted sequence (A), coronal T2-weighted sequence (B), and sagittal T1-weighted sequence with gadolinium enhancement (D), demonstrated an infiltrative process centered on the distal metaphyseal–epiphyseal region of the left femur, causing focal cortical destruction and showing endomedullary extension. The lesion exhibited heterogeneous enhancement after gadolinium administration and extended into the soft tissues of both the anterior and posterior compartments of the distal thigh

2.2. Case 2

A 54-year-old man presented with several months of persistent, dull bilateral iliac pain, which worsened with prolonged standing or walking. He denied systemic symptoms, including fever, night sweats, or weight loss, and reported no history of trauma. On examination, mild tenderness was observed over both iliac regions without palpable masses, swelling, or limitation of hip joint mobility. The patient was in good general condition.

Laboratory evaluation, including complete blood count, inflammatory markers, and metabolic panels, was within normal limits. Pelvic CT demonstrated multiple well-circumscribed osteosclerotic lesions involving both iliac wings, without cortical disruption or associated soft tissue mass. A CT-guided core needle biopsy of the right iliac wing revealed a lymphoid infiltrate arranged in follicular patterns, composed predominantly of centrocytes with occasional centroblasts. Immunohistochemistry was positive for CD20, CD10, and BCL-2, confirming the diagnosis of primary bone follicular lymphoma, a rare and indolent subtype of PBL. The patient was referred for hematology-oncology evaluation to establish a tailored therapeutic plan.

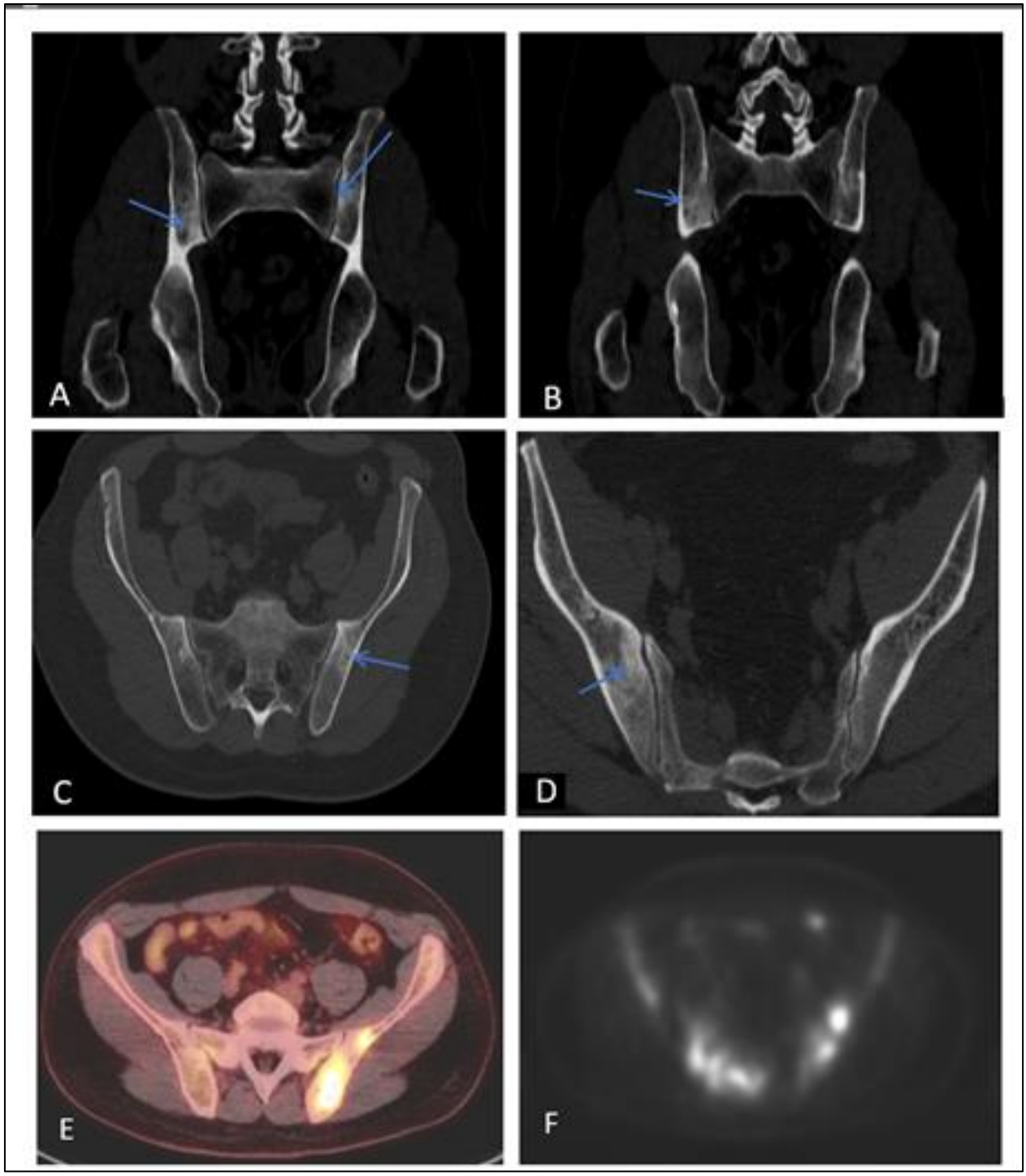

Figure 3 Coronal (A, B) and axial (C, D) CT images and TEP axials images (E, F) of the pelvis demonstrate multiple well- defined osteosclerotic lesions involving both iliac wings

2.3. Case 3

A 39-year-old woman with no significant past medical history presented with recurrent right- sided basithoracic pain that had progressively worsened over several weeks. She denied systemic symptoms, including fever, weight loss, or respiratory complaints. Physical examination revealed no tenderness, swelling, or palpable mass over the thoracic region.

Cardiopulmonary and abdominal examinations were unremarkable.

Chest CT demonstrated an osteolytic lesion in the posterior aspect of the right sixth rib, without cortical fracture or adjacent soft tissue involvement. A CT-guided biopsy confirmed diffuse large B-cell lymphoma (DLBCL), with immunohistochemical staining positive for CD20. The patient was referred to the hematology-oncology service for comprehensive staging and initiation of systemic chemotherapy

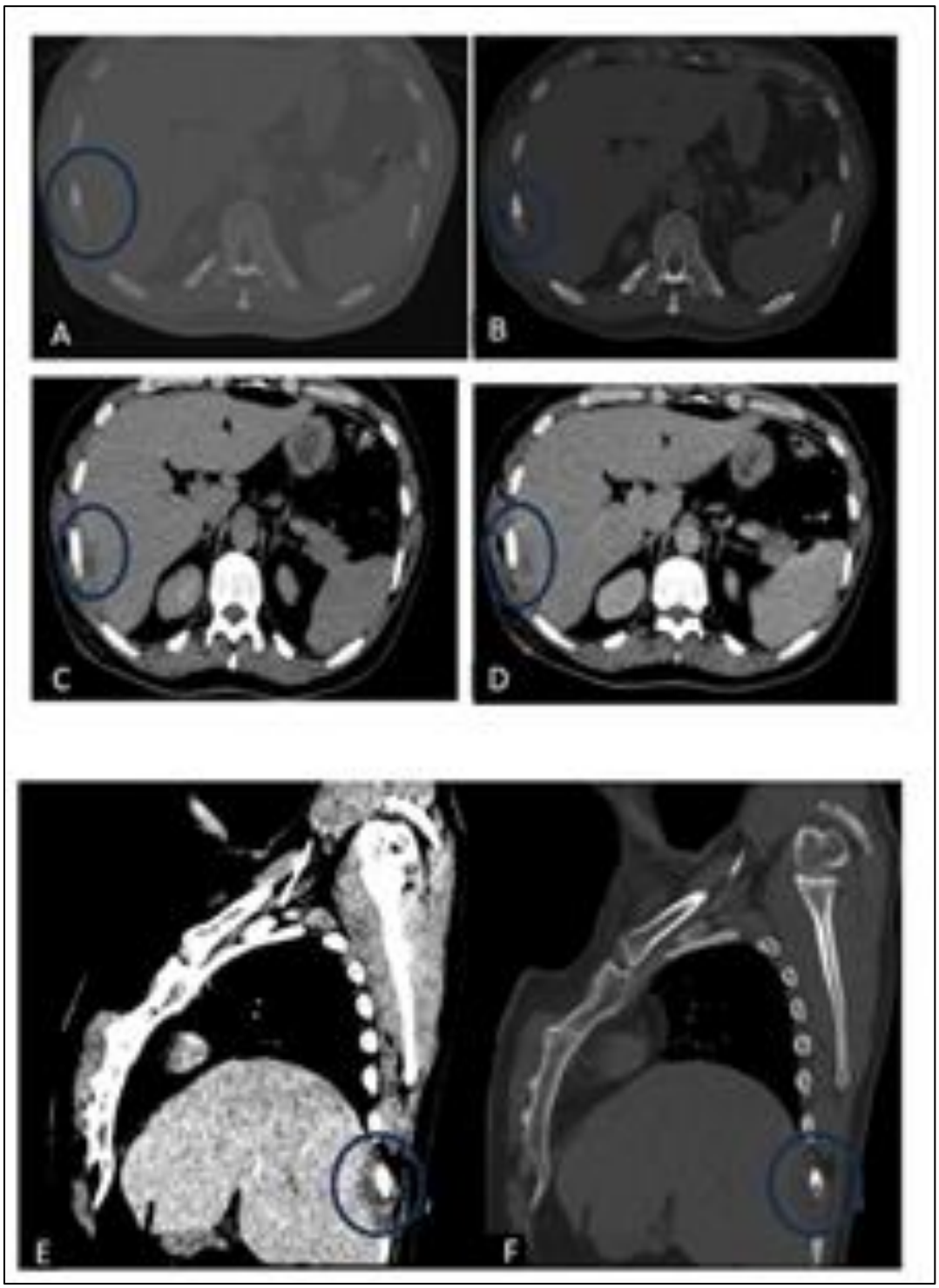

Figure 4 Axial (A, B, C, and D) and sagittal (E, F) CT images of the right 6th rib demonstrate a soft-tissue osteolytic lesion centered on the rib, causing focal cortical lysis

3. Discussion

Primary bone lymphoma (PBL) is a rare neoplasm of the skeletal system, accounting for a small fraction of primary bone tumors and representing 3–5% of extranodal non-Hodgkin lymphomas (1,2). Its rarity, combined with diverse clinical and radiological presentations, often poses significant diagnostic challenges. While diffuse large B-cell lymphoma (DLBCL) is the most frequently observed histologic subtype, indolent forms such as follicular lymphoma are exceedingly uncommon and remain poorly characterized in the literature (3–5). Clinically, PBL typically manifests as localized pain, swelling, or a palpable mass, whereas systemic "B" symptoms such as fever, night sweats, and weight loss are generally absent or infrequent (6). In our series, the first patient presented with progressive swelling and functional impairment of the left knee over two months, consistent with the classical presentation described in previous studies (7). The second patient exhibited bilateral iliac pain, a less typical pattern that underscores the diagnostic complexity of rare subtypes like follicular lymphoma. The third patient demonstrated an unusual presentation with an isolated osteolytic lesion of the sixth rib and recurrent basithoracic pain, highlighting that PBL may mimic other conditions such as metastases or chronic osteomyelitis (8). Collectively, these cases demonstrate that clinicians must maintain a high index of suspicion when encountering persistent or unexplained bone pain, particularly when initial imaging is inconclusive.

Radiological assessment plays a pivotal role in the evaluation of PBL. Lesions frequently appear osteolytic, with variable degrees of cortical destruction, and may extend into adjacent

soft tissues (9). MRI is particularly valuable in delineating the extent of medullary involvement and detecting subtle soft tissue infiltration, which may be missed on CT alone (10,11). However, imaging findings are not specific, and differential diagnoses include infectious processes (e.g., osteomyelitis), primary bone sarcomas such as Ewing sarcoma, metastatic lesions, and other hematologic malignancies. This underlines the importance of correlating imaging findings with clinical presentation and histopathology to avoid misdiagnosis.

Definitive diagnosis of PBL relies on histopathological examination, supported by immunohistochemistry. Most cases demonstrate B-cell markers such as CD20, and additional markers help distinguish between DLBCL and indolent subtypes like follicular lymphoma (12). Accurate subclassification is crucial, as it directly informs therapeutic decisions and prognostic assessment (13). Notably, indolent variants often require more individualized management strategies, while aggressive DLBCL generally warrants systemic chemotherapy with or without radiotherapy.

The mainstay of PBL treatment is systemic chemotherapy, most commonly R-CHOP for DLBCL. In certain cases, involved-field radiotherapy is added to enhance local control (14). Surgical intervention is primarily reserved for biopsy procurement or stabilization of pathological fractures. Prognostic outcomes are influenced by multiple variables, including patient age, International Prognostic Index (IPI) score, serum LDH levels, and disease stage at presentation (15,16). Early recognition and initiation of treatment are associated with improved survival and functional outcomes.

The occurrence of rare indolent subtypes, such as primary bone follicular lymphoma, adds further complexity to clinical management. These variants typically present with less aggressive features and may have a more favorable prognosis, but their low prevalence means that standardized treatment protocols are less well defined. Each case requires careful evaluation by a multidisciplinary team, integrating hematology-oncology, radiology, pathology, and orthopedic expertise.

This threecases reported exemplify the heterogeneity of PBL in terms of anatomical site, clinical presentation, radiological findings, and histopathology. They emphasize the necessity of maintaining vigilance for atypical presentations and the utility of early, guided biopsy for definitive diagnosis. Moreover, they highlight the importance of individualized management plans and a coordinated multidisciplinary approach, particularly when encountering rare or indolent subtypes.

4. Conclusion

Primary bone lymphoma is a rare malignancy with heterogeneous clinical and radiological presentations that can delay diagnosis. Prompt biopsy with detailed histopathological and immunohistochemical analysis is essential for accurate classification and optimal treatment planning. Systemic chemotherapy, with or without radiotherapy, generally achieves good outcomes when initiated early. The exceptional occurrence of indolent subtypes, such as primary bone follicular lymphoma, underscores the need for further reports and a multidisciplinary approach to improve recognition and management

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

"Informed consent was obtained from all individual participants included in the study."

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