

## Disseminated Primary Non-Hodgkin's Lymphoma of Bone : A Case Report<sup>1</sup>

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Primary lymphoma of bone is uncommon and disseminated non-Hodgkin's lymphoma is extremely rare. The authors report a case of primary non-Hodgkin's lymphoma of bone involving the whole skeleton without evidence of involvement of lymph nodes or other tissue. Radiographic examination demonstrated moth-eaten or permeative bone destruction with endosteal scalloping. The MRI revealed hypointense bone marrow to fat on T2 weighted image before treatment. Bone marrow biopsy and subsegment immunohistochemical studies demonstrated the presence of non-Hodgkin's lymphoma, T-cell type. The patient underwent standard chemotherapy and showed marked resolution, clinically and radiologically.

**Index words :** Bones, diseases

Bone neoplasms, diagnosis

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Primary bone lymphoma is a rare tumor, accounting for approximately 3% of primary malignant bone tumors and for 5% of extranodal lymphoma (1). In the majority of cases, the tumor involves the extremities and less frequently the axial skeleton. Disseminated malignant lymphoma is extremely rare, representing 0.8% of malignant non-Hodgkin's lymphoma (NHL) (2).

Here, we encountered primary NHL of bone involving the skull, spine, both upper and lower extremities and the pelvis without involvement of lymph nodes or other tissue.

We report radiographic and MR findings of this case of pathologically proven NHL involving the whole skeleton and findings suggesting resolution of the lesion on follow-up radiography and MRI after chemotherapy.

### Case Report

A 5-year-old boy presented with a 10 month history of pain and limping gait in the left leg.

During the 8 month period prior to admission, he also developed lower extremity weakness. Initial radiographic examination showed multiple osteolytic lesions with moth eaten bone destruction in the lower metaphyses of both femurs and the upper and lower metaphyses of both tibiae and fibulae. Similar lesions involving the upper limbs, skull, spine and pelvis were also noted (Fig. 1A, B, C). However, pathologic fractures or soft tissue masses were not shown on plain radiography. Radionuclide scanning showed no definite abnormality. Bone densitometry revealed osteoporosis of lumbar spines. No remarkable finding was noted on abdominal CT. A CT scan of the lower leg showed poor definition of the tibial lesion with a few internal bony septae, no matrix calcification, breaching of the cortical bone a small soft tissue mass.

On MR images of the lower extremities, the tumor

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showed low signal intensity on T1-weighted image. The T2-weighted images demonstrated predominantly low signal intensity with a high signal extending peripherally into the tibial plateau (Fig. 1D, E). Bone marrow biopsy revealed scattered atypical lymphoid cells and immunohistochemical staining was positive for T lymphocytes (Fig. 1H, I). Abdomen and chest CT revealed no additional sites of involvement.

The patient was subsequently treated with cyclophosphamide, vincristin, prednisolone and methotrexate.

Follow up plain radiography revealed marked improvement of the lesions involving both tibia while follow-up MRI demonstrated recovery of the marrow signal of the spine (Fig. 1J, K, L).

### Discussion

Primary lymphoma of bone is an uncommon tumor that includes 1 % of lymphoma cases and less than 5 % of all primary malignant bone tumors (1). It may occur at any age. In the majority of patients, however, the age of onset is over 20 years (93 %), and in half it is over 40 years. It affects men more frequently than women (3).

Primary lymphoma of bone predominantly involves the following sites: femur (29 %), pelvis (19 %), humerus (13 %), head and neck (11 %) and tibia (10 %) (4). In the long bones, it is usually metaphyseal or diaphyseal in location, rarely involving the epiphysis. When primary lymphoma of bone disseminates, a tendency to spread to other bony sites is recognized (4). Our case showed extensive involvement of the long bones, as well as in the spine and the flat bones of the pelvis and the skull.

The clinical presentation reflects the localized nature of the disease, with pain and swelling at the site of the tumor. The lesions of primary lymphoma of bone may be quite large on presentation because of the relative lack of symptoms. Signs of aggressiveness include pathologic fracture, cortical destruction and periosteal reaction (5, 8). Soft tissue or nodal involvement appear to be important prognostic indicators. Thus, CT of the abdomen and chest is necessary to exclude systemic involvement (5). In our case, the patient presented with pain and weakness of the lower extremities, though no systemic symptoms were present. Abdomen and chest CT revealed no additional sites of involvement.

The radiologic appearance varies widely and is often not characteristic; it can mimic osteosarcoma, Ewing's sarcoma, and other bone tumors, as well as osteomyelitis (6). Histiocytosis and chronic diffuse osteitis can also be

included for radiological differential diagnosis.

In disseminated lymphoma, hematogeneous bone metastasis should be excluded. Metastasis generally affects multiple sites. The axial skeleton and skull, which contain red marrow, are the most frequent sites. Radionuclide bone scanning is a sensitive test for metastatic disease to bone. But bone metastasis from various tumors occurs below the knee in only 3.9 % of affected individuals, and only 4 % occur anywhere in the femur. Metastasis to the skull occurs with a frequency of approximately 10 %. Given their low individual rates of occurrence, the incidence of combined metastases to these three locations must be very low (7). In cases of acute leukemia, scattered osteoporotic lesions with vertebral collapse have been reported but cortical bone lesions scattered over the whole skeleton are very rare (2). In infants and children, periostitis and extensive bone resorption in hyperparathyroidism may simulate the findings of the lymphoma and leukemia (8).

On conventional radiographs, involved bone shows a moth-eaten or permeative pattern with endosteal scalloping that may be complicated by cortical destruction with tumor extension into the surrounding soft tissue. The margins are poorly defined, presenting a wide zone of transition (1). Our case showed similar radiologic findings (Fig. 1A, B, C).

Whole-body bone scan is superior to regional studies in assessing distribution of lesions. Although sensitive for the detection of osseous lymphoma, bone scan have a high rate of false negativity, especially for pelvic lesions (7).

MRI appears to be a superior method of analyzing marrow involvement in primary lymphoma of bone. Generally, bone tumors show high signal intensity on T2-weighted images, due presumably to an increase in the amount of tissue fluid. In primary lymphoma of bone the signal intensity of the lymphomatous marrow is variable on T2-weighted image from low to high signal intensity. Our case demonstrated predominantly low signal intensity on T2-weighted image in the proximal and midportion of the tibia taken before treatment (Fig. 1D, E). This correlated with a large amount of fibrosis in the biopsy specimen. The low signal intensity of fibrosis on T2WI has been attributed to the effect of the large regular structures of collagen on the motion of water molecules, which shortens T2 relaxation time (4).

Treatment response in disseminated non-Hodgkin's lymphoma is best assessed radiographically. The radiographic finding for repair is normalization of trabecula-

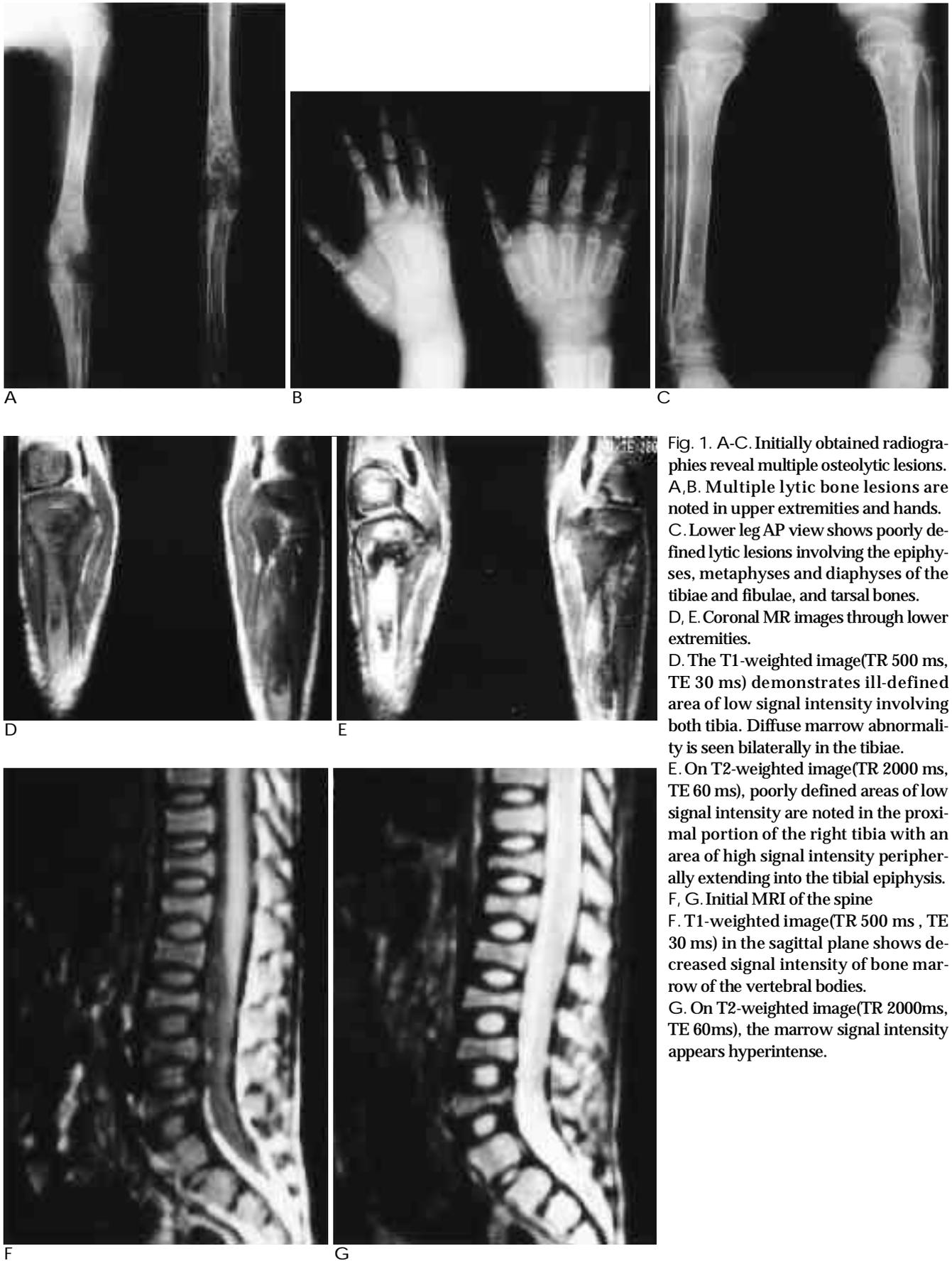


Fig. 1. A-C. Initially obtained radiographies reveal multiple osteolytic lesions. A,B. Multiple lytic bone lesions are noted in upper extremities and hands. C. Lower leg AP view shows poorly defined lytic lesions involving the epiphyses, metaphyses and diaphyses of the tibiae and fibulae, and tarsal bones. D, E. Coronal MR images through lower extremities. D. The T1-weighted image (TR 500 ms, TE 30 ms) demonstrates ill-defined area of low signal intensity involving both tibia. Diffuse marrow abnormality is seen bilaterally in the tibiae. E. On T2-weighted image (TR 2000 ms, TE 60 ms), poorly defined areas of low signal intensity are noted in the proximal portion of the right tibia with an area of high signal intensity peripherally extending into the tibial epiphysis. F, G. Initial MRI of the spine. F. T1-weighted image (TR 500 ms, TE 30 ms) in the sagittal plane shows decreased signal intensity of bone marrow of the vertebral bodies. G. On T2-weighted image (TR 2000ms, TE 60ms), the marrow signal intensity appears hyperintense.

tion. Conversely, in patients with progression of disease, increased lytic, destructive appearances are shown on post-treatment radiographs. However evidence from bone scan and MRI of progression or healing following treatment do not correlate with clinical outcome (9). Our case showed considerable normalization of trabeculae after treatment (Fig. 1L).

We have reported plain radiographic and MR findings of a rare case of a primary non-Hodgkin s lymphoma involving nearly the entire skeleton and findings suggesting resolution of the lesion after chemotherapy. MRI is a useful modality for detecting the extent of marrow abnormality but radiography is also helpful in follow-up assessment of the treatment response.

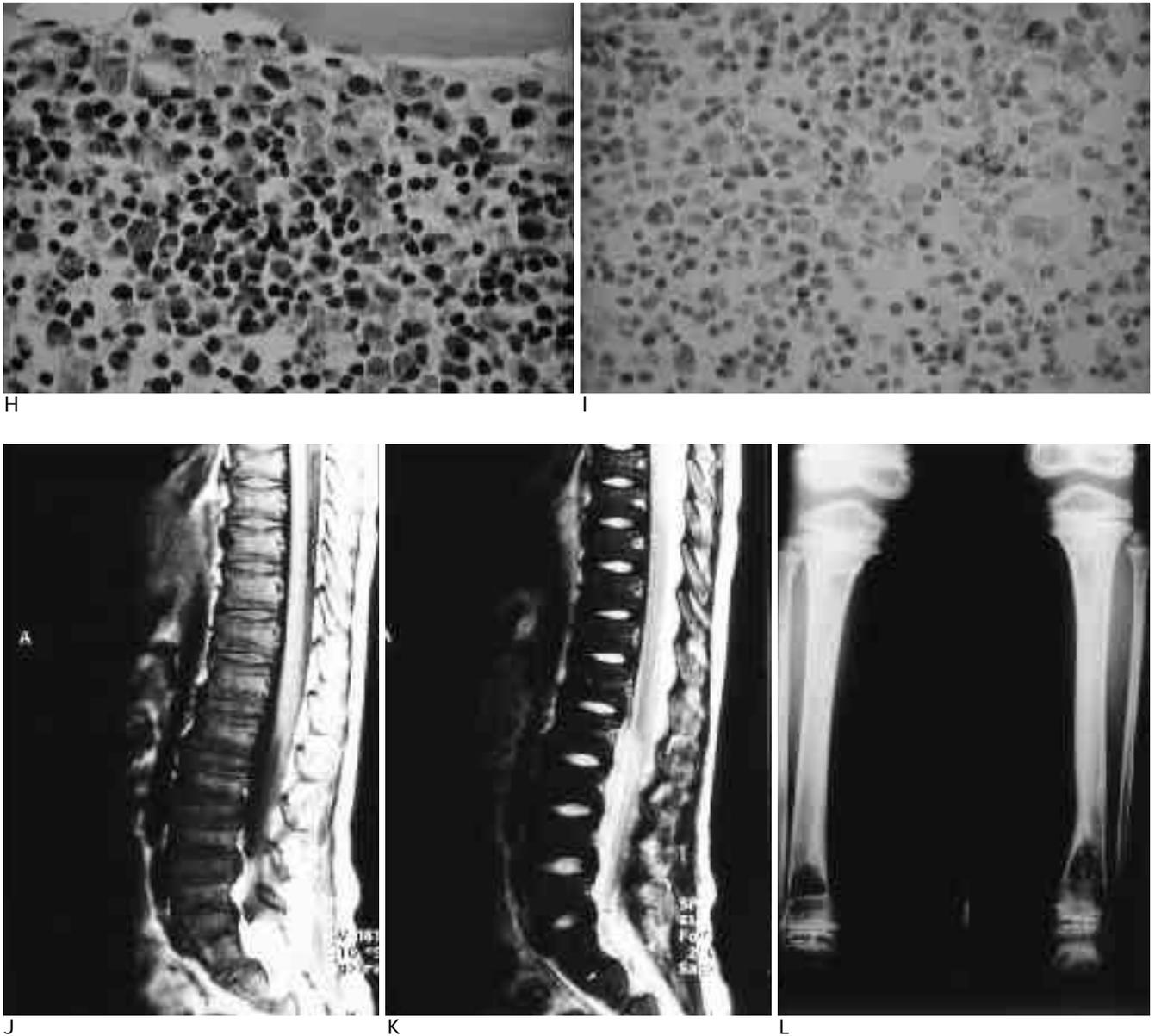


Fig. 1. H, I. Biopsy specimen

H. Photomicroscopic examination of the bone marrow shows scattered atypical lymphoid cells. (H & E, original magnification,  $\times 200$ )

I. Immunohistochemical stain shows positive staining for T lymphocytes. (primary antibody= Dako, UCHL-1, original magnification,  $\times 200$ )

J, K. Follow up MRI of the spine after 6 cycles of chemotherapy for 2 years.

J. T1-weighted image (TR 600ms, TE 12ms) reveals diffuse low signal intensity of bone marrow of the vertebral bodies.

K. T2-weighted image (TR 4000ms, TE 120ms) reveals hypointense signal compared with initially performed MRI.

L. Radiograph of both lower extremities 1 year later after chemotherapy ceased. Normalization of trabeculation in the diaphyses is shown but the lytic lesions in both epiphyses and metaphyses still remain.

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