

Brief Note

Acute Lymphocytic Leukemia Presenting as Multiple Cold Defects on Bone Scintigraphy

Accepted for publication on September 7, 1989

Key words : bone scintigraphy — cold defect — acute lymphocytic leukemia

Bone scintigraphy with ^{99m}Tc -labeled phosphorous compound is an excellent technique for the detection of malignant bone metastasis.¹⁻³⁾ Bone metastases are usually visualized as multiple hot spots on bone scintigraphy.

However, photon deficiency has been reported in few cases of not only bone invasion but also bone infarction and avascular necrosis.^{4,5)} In a patient with acute lymphocytic leukemia, we evaluated the photopenic phenomena on bone scan and compared the results with radiographic and laboratory data.

A 13-year-old male patient, previously diagnosed as having acute lymphocytic leukemia, was admitted to our hospital with a suspected relapse of the disease in April 1983.

He was placed under a chemotherapy regimen consisting of vincristine, daunorubicin, steroid and 1-asparaginase. Pathological cells in a bone marrow specimen aspirated from the sternum decreased 7 days after initiating treatment.

However, he complained of back pain and lumbago 17 days after treatment. Bone scintigraphy was performed to evaluate the bone pain. In leukemia during childhood, bone scintigraphy usually demonstrates normal finding or areas of increased uptake.^{6,7)} However, in the present case, multiple cold defects were noted in the thoracic and lumbar spines, and the ribs on bone scintigraphy (Fig. 1a). As a cause of the cold defects, tumorous invasion into the bone structure by leukemic cells seemed unlikely, since neither radiographic evidence of osteolytic change (Fig. 1b) nor focal ^{67}Ga uptake was present. Furthermore, the laboratory data at this time revealed improvement of the disease.

Some drugs such as vincristine, alkalating agent and procarbazine with steroid have been implicated in the cause of bone necrosis.⁸⁾ In these cases, bone necrosis occurs mainly in the femoral head, and very rarely in the vertebrae, to which blood is plentifully supplied. Although the exact mechanism of the cold defects on bone scintigraphy in this case is unclear, we proposed that drug-induced bone necrosis rather than the infiltration of leukemic cells might be probable cause. Therefore, it is necessary to keep in mind that this type of lesion may occur as a manifestation of avascular necrosis under chemotherapy against leukemia during childhood.

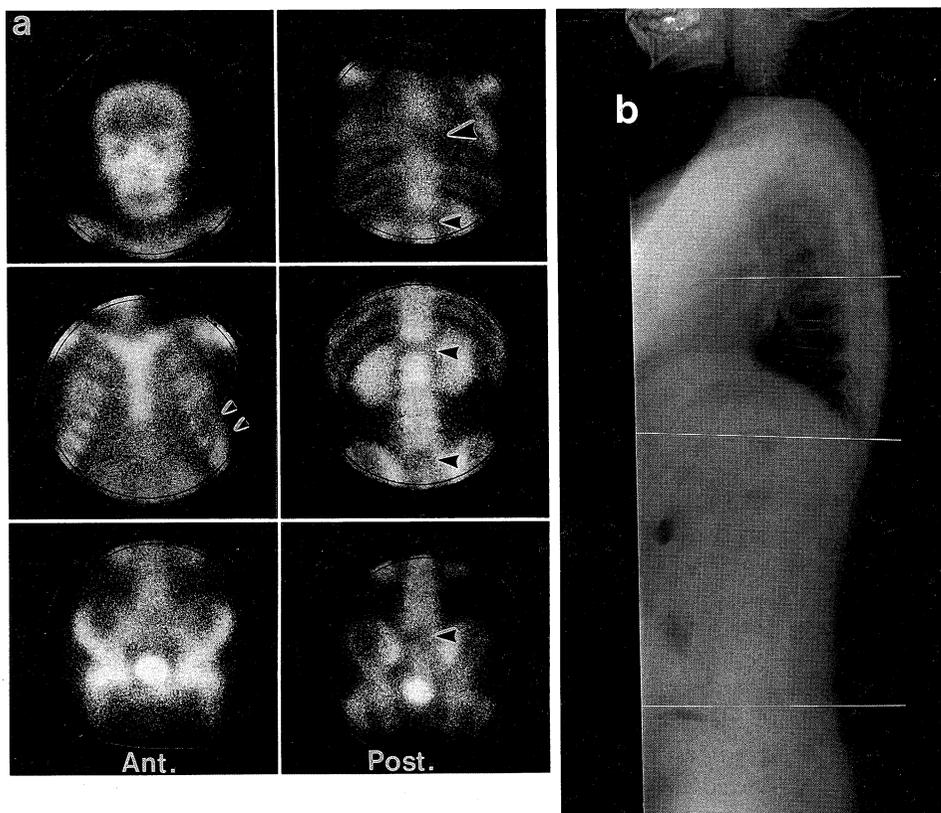


Fig. 1 a : Bone scintigraphy: Multiple cold defects were noted in the ribs, thoracic and lumbar spines.

Fig. 1 b : Bone radiogram of the thoracic and lumbar spines: Osteoporotic change and compression fracture of the thoracic spine were noted. Osteolytic change was not detected.

**Nobuaki OTSUKA, Masao FUKUNAGA,
Koichi MORITA, Shimato ONO,*
Kiyohisa NAGAI and Soichi NISHISHITA***

*Department of Nuclear Medicine,
*Department of Radiology,
Kawasaki Medical School,
Kurashiki 701-01, Japan*

REFERENCES

- 1) Osmond, J.D., Pendergrass, H.P. and Potsaid, M.S.: Accuracy of ^{99m}Tc -diphosphonate bone scans and roentgenograms in the detection of prostate, breast and lung carcinoma metastases. *A.J.R.* 125 : 972-977, 1975
- 2) Tofe, A.J., Francis, M.D. and Harvey, W.J.: Correlation of neoplasms with incidence and localization of skeletal metastases: An analysis of 1,355 diphosphonate bone scans. *J. Nucl. Med.* 16 : 986-989, 1975

- 3) Corcoran, R.J., Thrall, J.H., Kyle, R.W., Kaminski, R.J. and Johnson, M.C.: Solitary abnormalities in bone scan of patients with extraosseous malignancies. *Radiology* **121** : 663-667, 1976
- 4) Otsuka, N., Fukunaga, M., Morita, K., Ono, S., Nagai, K., Tomomitsu, T., Yanagimoto, S., Imai, S., Kajihara, Y., Nishishita, S., Koyama, K., Furukawa, Y., Tanaka, H. and Morita, R.: Skeletal metastasis in renal cell carcinoma: Photon deficiency on bone scintigraphy. *Kawasaki Med. J.* **13** : 195-205, 1987
- 5) Greyson, N.D. and Kassel, E.E.: Serial bone-scan changes in recurrent bone infarction. *J. Nucl. Med.* **17** : 184-186, 1976
- 6) Caudle, R.J., Crawford, A.H., Gelfand, M.J. and Gruppo, R.A.: Childhood acute lymphoblastic leukemia presenting as "cold" lesions on bone scan: A report of two cases. *J. Pediatr. Orthop.* **7** : 93-95, 1987
- 7) Kuntz, D.J., Leonard, J.C., Nitschke, R.M., Vanhoutte, J.J., Wilson, D.A. and Basmadjian, G.P.: An evaluation of diagnostic techniques utilized in the initial workup of pediatric patients with acute lymphocytic leukemia. *Clin. Nucl. Med.* **9** : 405-408, 1984
- 8) Rosenthal, L.: The bone scan in avascular necrosis. *In* Bone scanning in clinical practice, ed. by Fogelman, I. London, Springer-Verlag, 1986, pp. 151-174