Case Report: Malignant Fibrous Histiocytoma: Etiology for a Cold Defect on Technetium-99m-Methylene Diphosphonate Bone Scan

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Various causes for cold defects on bone scans (e.g., avascular necrosis) have been described. A case is presented in which a cold defect on a technetium-99m-methylene diphosphonate bone scan was the result of malignant fibrous histiocytoma.

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Malignant fibrous histiocytoma (MFH) is a soft-tissue sarcoma of undifferentiated mesenchymal cell origin (*1*) and is considered the most common soft-tissue sarcoma in adults (*2*). It commonly occurs in the 5th and 6th decades with a 2:1 male to female predominance. It most frequently occurs in the extremities and retroperitoneum. There have been numerous descriptions of the typical radiographic appearance of MFH (*3*, *4*, *5*), which will be discussed below. This is the case of a cold defect on a technetium-99m-methylene diphosphonate (^{99m}Tc-MDP) bone scan as a result of MFH.

CASE REPORT

A 66-yr-old male presented with a 1-yr history of pelvic pain and weight loss, and a 3-mo history of decreasing strength in the lower extremities. Physical examination was unremarkable except for decreased strength in all muscle groups of the lower extremities and decreased rectal tone. Lumbosacral spine series and computed tomography (CT) scan showed a large retroperitoneal soft-tissue mass with a compression fracture of L2 and cortical erosion of the superior end plate of L3 (Fig. 1A-1B). Gallium scan revealed avid uptake by the mass (Fig. 1C). Bone scan revealed a "cold" L2 vertebral body (Fig. 1D). Exploratory laparotomy revealed a large retroperitoneal soft-tissue mass that surrounded and invaded the L2 vertebral body. MFH was the diagnosis by open biopsy.

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DISCUSSION

This case demonstrates the typical plain film, CT, and gallium scan findings for a retroperitoneal MFH. The most common plain film finding is a soft-tissue mass. Secondary bony involvement, as seen in this case, is only present in ~20% of the cases (*2*). Computed tomography typically demonstrates a poorly marginated soft-tissue mass with central tumor necrosis (*6*). MFH reportedly has avid uptake on both ^{99m}Tc-MDP and ^{67}Ga (*3*). The bone scan in this case reveals a cold defect of the L2 vertebral body with no significant uptake by the soft-tissue component.

Multiple causes for cold defects on bone scan have been described with avascular necrosis, malignant bone tumors, and metastatic bone disease being the most common (*7*). Pertaining to metastatic disease, two mechanisms have been postulated as possible causes of the cold defect on bone scans. These include: (1) total interruption of the blood supply to a bone secondary to necrotic tumor outgrowing its blood supply or (2) total replacement of normal bony structure by tumor with no viable osteoblasts remaining to accumulate the radionuclide (*8*). Although a cold defect on bone scan has not previously been reported in MFH, one of the above mechanisms is likely responsible for producing the photon-deficient area seen in this case.

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REFERENCES

1. Weiss SW, Enzinger FM. Malignant fibrous histiocytoma: an analysis of 200 cases. *Cancer* 1978; 41:2250–66.
2. Kearney MM, Soule HE, Ivins JC. Malignant fibrous histiocytoma: retrospective study of 167 cases. *Cancer* 1980; 45:167–78.
3. Ros PR, Viamonte M, Rywlin AM. Malignant fibrous histiocytoma: mesenchymal tumor of ubiquitous origin. *AJR* 1984; 142:753–9.
4. Mackey JK, Alexieva-Jackson B, Fetters DV, et al. Bone and

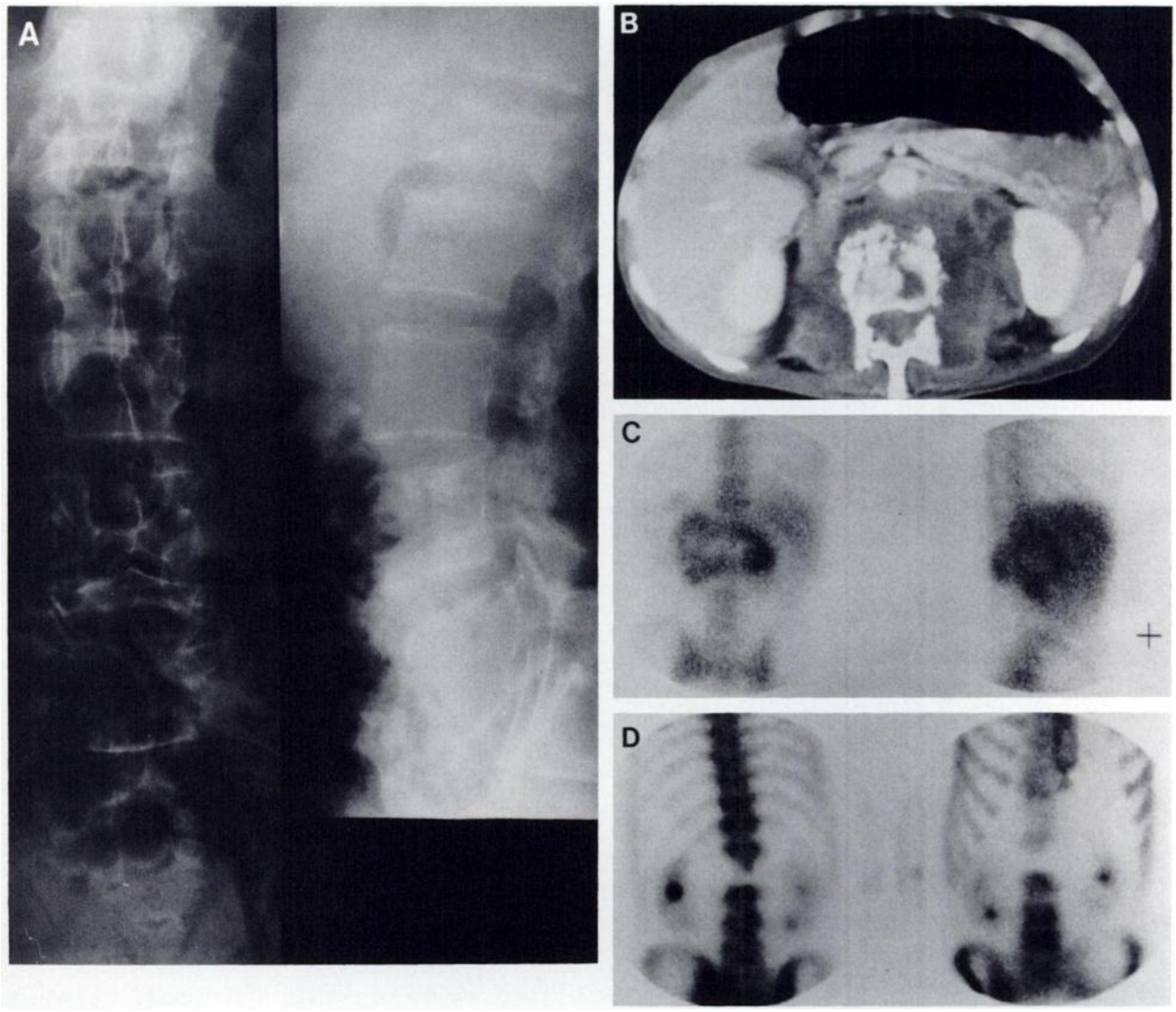

FIGURE 1
(A) Plain films of the lumbar spine reveal collapse of L2 with a surrounding soft-tissue mass. (B) Postinfusion CT scan of the abdomen at the level of the kidneys shows a retroperitoneal mass invading the adjacent vertebral body. (C) Gallium scan shows the large retroperitoneal soft-tissue mass. (D) Technetium-99m-MDP bone scan with anterior and posterior views of the lumbar spine. There is no uptake by the L2 vertebral body.

gallium scan findings in malignant fibrous histiocytoma: case report with radiographic and pathologic correlation. *Clin Nucl Med* 1987; 12:17–21.

5. Rosenthal L. Tc-99m-methylene diphosphonate concentration in soft tissue malignant fibrous histiocytoma. *Clin Nucl Med* 1978; 3:58–61.
6. Paling MR, Hyams DM. Computed tomography in malignant fibrous histiocytoma. *J Comput Assist Tomography* 1982; 6:785–8.
7. Stadalnik RC. "Cold" spot - bone imaging. *Semin Nucl Med* 1979; IX(1):2.
8. Resnick D, Niwayama G. *Diagnosis of bone and joint disorders, Volume 1.* New York: W.B. Saunders Co; 1988:469–473.