

Stress Fractures Associated with Osteosarcoma of the Lower Limb

Miguel Gorenberg, David Groshar, Ora Israel, Myriam Weye Ben-Arush, Gerald M. Kolodny, and Dov Front

Departments of Nuclear Medicine and Oncology, Rambam Medical Center, and Bruce Rapaport Faculty of Medicine, Technion-Israel Institute of Technology, Haifa, Israel

Three patients with osteosarcoma of the femur developed abnormal radiopharmaceutical uptake in the bones of the contralateral leg. This uptake was not due to metastases. The histology in one patient, the form of the lesion and the disappearance of the abnormal uptake without treatment in the other two, indicated that the uptake was probably due to stress fractures. Changes in weight bearing and walking in the normal leg as a result of the osteosarcoma in the other leg could have been the cause of the stress fractures. It should be recognized that new abnormal uptake on bone scintigraphy in patients with osteosarcoma of the leg may not necessarily indicate metastasis. It may be caused by a stress fracture and disappears after rest.

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Bone metastases are common in osteosarcoma and bone scintigraphy is commonly used for screening for this ominous sign of disease progression (1). On scintigraphy, however, new bone lesions need not always indicate metastases. We report here three patients with primary osteosarcoma of the femur, with new abnormal uptake on bone scans, in the contralateral limb that was caused by a stress fracture.

CASE REPORTS

Case 1

A 25-yr-old woman was admitted with pain and a firm, tender mass in the right hip. A ^{99m}Tc -methylene diphosphonate (MDP) bone scan revealed increased abnormal uptake in the proximal right femur. It also showed abnormal focal uptake in the distal third of the contralateral left fibula (Fig. 1). X-rays and CT of the proximal femur showed characteristic findings of osteosarcoma. There was a sclerotic and lytic process in the distal third of the left fibular shaft with periosteal response but no cortical disruption. Histopathological examination of a biopsy from the right femoral head showed osteoblastic osteosarcoma. A biopsy from the fibular lesion showed periosteal reaction, callus formation and signs of medullary new bone formation without any evidence of malignancy. The findings in the fibula were considered to be a healed stress fracture. The patient refused suggested surgery for

right hip disarticulation and has been clinically unchanged for 7 mo.

Case 2

An 11-yr-old girl with an osteosarcoma of the right proximal femur was treated with high dose Methotrexate, Cisplatin and Adriamycin. Despite treatment, the tumor increased in size and the patient underwent a right leg disarticulation. Ten months after surgery, routine follow-up bone scintigraphy showed abnormal focal uptake in the proximal third of the left tibia (Fig. 2A). X-rays showed a sclerotic lesion in the same site.

The lesion was considered a metastasis and the patient's parents refused any further oncological treatment. A bone scan 8 mo later, however, showed that the focal uptake had completely disappeared (Fig. 2B) and the patient had no evidence of disease for 22 mo after surgery.

Case 3

A 9-yr-old girl with osteosarcoma of the distal femur was treated with high dose Methotrexate, Cisplatin and Adriamycin for 4 mo before undergoing excision of the right distal femur and replacement with a telescopic prosthesis. She received Ifosfamide and Adriamycin for 6 mo following surgery. Five months after chemotherapy, when she complained of pain at the superior part of the prosthesis, a biopsy showed local recurrence. She underwent hip disarticulation and second-line chemotherapy with Ifosfamide and Etoposide. There was improvement and she began to walk using crutches. Seven months after surgery, routine follow-up bone scintigraphy showed abnormal focal uptake in

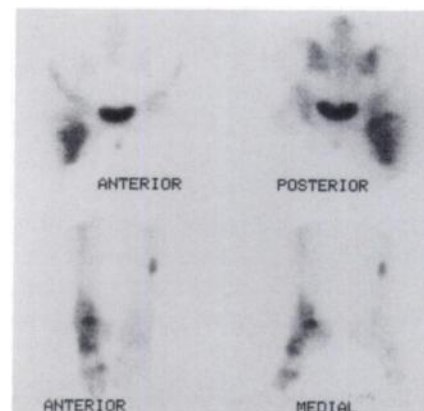


FIGURE 1. A 25-yr-old woman with osteosarcoma of the proximal right femur. Scintigraphy shows abnormal uptake in the proximal part of the right femur extending beyond the contour of the bone. A second area of increased uptake in the left distal fibula was found on histology to be due to a stress fracture.

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For reprints contact: Dov Front, MD, PhD, Department of Nuclear Medicine, Rambam Medical Center, Haifa 35254, Israel.

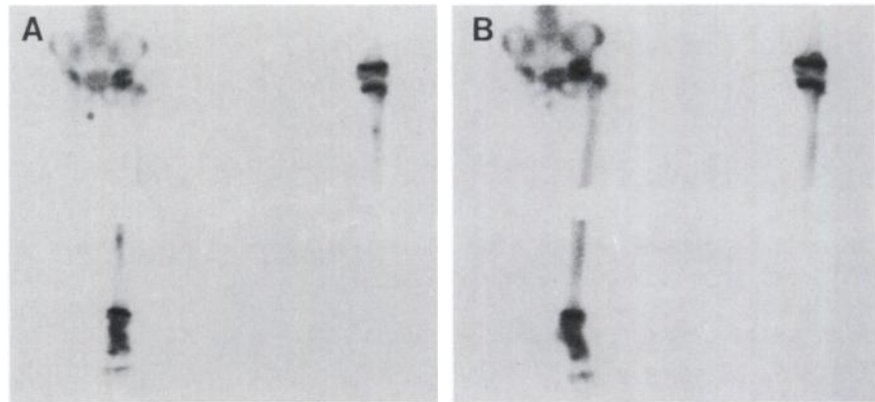


FIGURE 2. An 11-yr-old girl with an osteosarcoma of the right femur. Bone scintigraphy after surgery for disarticulation and removal of the right leg shows focal abnormal uptake in the proximal third of the left tibia (A). Normal bone scintigraphy 8 mo later (B). The patient did not receive treatment between the two studies.

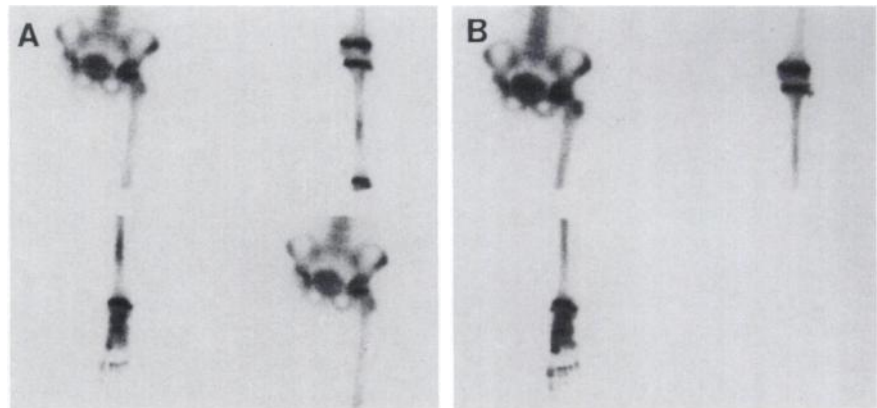


FIGURE 3. A 9-yr-old girl with osteosarcoma of the distal right femur. The patient underwent hip disarticulation and chemotherapy. Seven months after surgery, bone scintigraphy shows spindle-shaped abnormal uptake in the middle third of the left tibia (A). The abnormal uptake disappeared 9 mo later without treatment (B).

the middle third of the left tibia (Fig. 3A). There were no symptoms and x-ray studies were normal. The possibility that she developed a stress fracture was considered in view of the previous two patients and only rest was recommended. A subsequent bone scan 9 mo later (Fig. 3B) showed disappearance of the focal uptake in the left tibia. The patient remained asymptomatic for 18 mo.

DISCUSSION

Bone metastases are relatively common in osteosarcoma (1-3). When they appear at the initial presentation, conservative nonsurgical therapy is indicated. The prognosis is poor and the majority of patients die within 2 yr (1). Osseous metastases occur in 41% of patients in later phases of the disease (1). Abnormal uptake in metastasis, however, should not be confused with abnormal uptake from other causes such as stress fractures, as seen in our patients.

Stress fractures result from unusual, repeated physical activity that causes absorption of bone in excess of repair (4). It is localized most frequently in the tibia and the fibula (4-6). The continual stress on a weakened bone leads to cortical and trabecular disruption and subsequently may cause a frank fracture. The radiological signs of the healing phase of a stress fracture may be misinterpreted as indicative of a malignant lesion (5,7). It is not always possible to distinguish benign from malignant periosteal response and irregular medullary sclerosis may be present in both entities (4,7). Fracture and new bone, when seen end-on, may mimic the lysis and sclerosis of a

malignant lesion. An uninterrupted periosteal reaction and absence of true cortical destruction, however, should suggest a benign lesion (7).

Osteosarcoma of the femur is associated with changes in the walking habit of the patient with leaning on the nonaffected leg. These could cause stress fractures in such patients. The form and the spontaneous disappearance of the abnormal uptake in two of the patients is consistent with stress fractures (4). The patients described here illustrate that the presence of new abnormal bone uptake of $^{99m}\text{Tc-MDP}$ in osteosarcoma need not be indicative of metastatic disease. It can be caused by a stress fracture, a benign condition which requires only rest. Future evaluation with tumor-seeking agents, such as ^{201}Tl , $^{99m}\text{Tc-MIBI}$ or ^{67}Ga may be of value in improving specificity.

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