

Scintigraphic Findings of Fibular Donor Sites

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Vascularized fibulas are used for reconstruction of bony defects after surgical removal of malignant skeletal tumors. Here, we describe scintigraphic findings at fibular donor sites in three patients who underwent limb salvage procedures for primary malignant bone tumors.

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Limb salvage procedures using allografts at the site of resected malignant skeletal tumors are well known (1,2). Technetium-99m-labeled methylenediphosphonate scintigraphy is usually used after a limb salvage procedure for follow-up assessment of allograft survival and for the detection of complications at the recipient site. Scintigraphic findings at the recipient site have been reported in the literature (3). We found interesting scintigraphic changes at the fibular donor site in three patients, one of whom was shown to have a partial regeneration of the fibula, or a neofibula.

CASE REPORTS

Patient 1

A 19-yr-old woman had surgical removal of osteosarcoma of the right humerus and a fibular graft at the operative site. Technetium-99m-methylenediphosphonate scintigraphy was obtained 2 days after the surgery (Fig. 1A). Radiotracer activity was noted at the fibular donor site initially. However, it disappeared on skeletal scintigraphy 1 yr later (Fig. 1B). The radiograph obtained 17 mo after the surgery showed an absence of the fibular segment at the donor site (Fig. 1C). On both scintigraphic studies, focally increased radiotracer activity was also noted at the site of fixation of the distal fibular segment with the distal tibia on the donor side.

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Patient 2

An 11-yr-old boy with history of Ewing's sarcoma of the third lumbar vertebra had surgical resection of the tumor and anterior strut fibular grafting. Skeletal scintigraphy obtained 4 mo after the surgery and at 9 mo (Fig. 2A) revealed persistent irregular increased radiotracer activity at the fibular donor site. Radiography 6 mo after the surgery revealed regeneration at the donor fibular site, creating a neofibula (Fig. 2B). Focal increased uptake was noted at the site of fixation of distal fibular segment with the distal tibia on the donor side.

Patient 3

A 13-yr-old girl underwent resection of a primitive neuroectodermal tumor of the left tibia and fibular graft. Skeletal scintigraphy obtained at 4 mo and at 9 mo after the surgery revealed no radiotracer uptake at the donor fibular graft site. A radiograph obtained at 9 mo after the surgery showed no regeneration of the donor fibula. In addition to the above findings, focal increased uptake was also noted at the site of distal tibiofibular fixation on the donor side on both the tissue phase and delayed scintigraphic images (Fig. 3).

DISCUSSION

Free vascularized fibular graft was introduced by Taylor in 1975, and since then, its application for reconstruction of large bony defects due to trauma or surgery has been well known. It is preferable to leave a small segment of fibula both proximally and distally. Tibiofibular syndesmosis usually is performed to maintain ankle stability (4). Regeneration can occur and fill the resected fibular donor site with a neofibula (4). The mechanism of this regeneration is not well understood.

Radiotracer activity can be noted at the donor fibular site in various patterns. Complete regeneration in the fibular donor site has been described radiographically (4). However, scintigraphic findings of regeneration of a fibula have not been described.

In Patient 2, persistent, well-defined radiotracer activity was

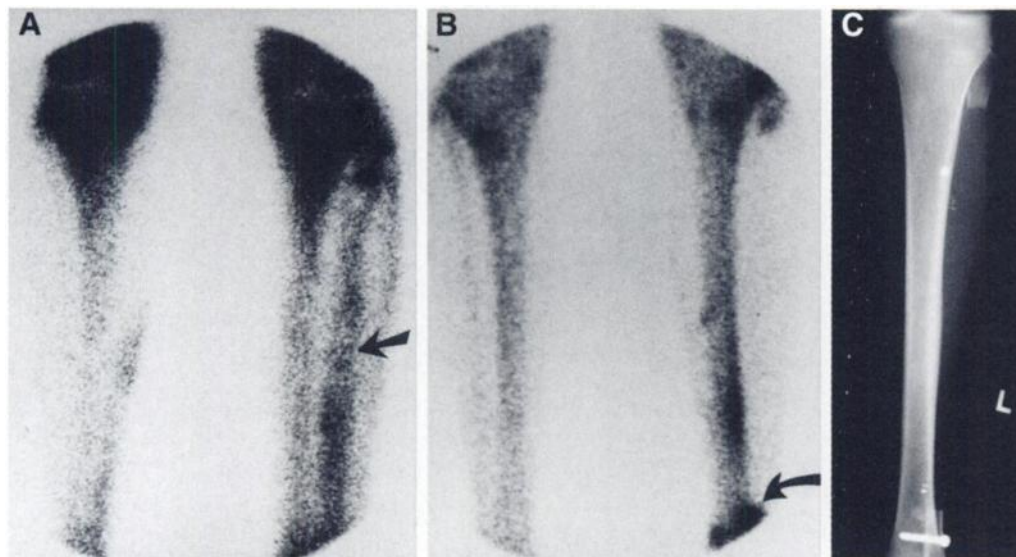


FIGURE 1. Technetium-99m skeletal scintigraphy in a 19-yr-old woman who had surgical removal of osteosarcoma of the right humerus and left fibular graft. Anterior scintigraphy of the lower legs (A) shortly after surgery revealed patchy irregular increased radiotracer activity in the left donor fibular site (arrow). One year later, on an anterior scintigram (B), radiotracer activity was absent at the site of donor fibular segment, and there was focally increased uptake at the distal tibiofibular fixation (curved arrow). The frontal radiograph (C) of the lower leg of the same patient shows the absence of the fibular segment at the donor site.

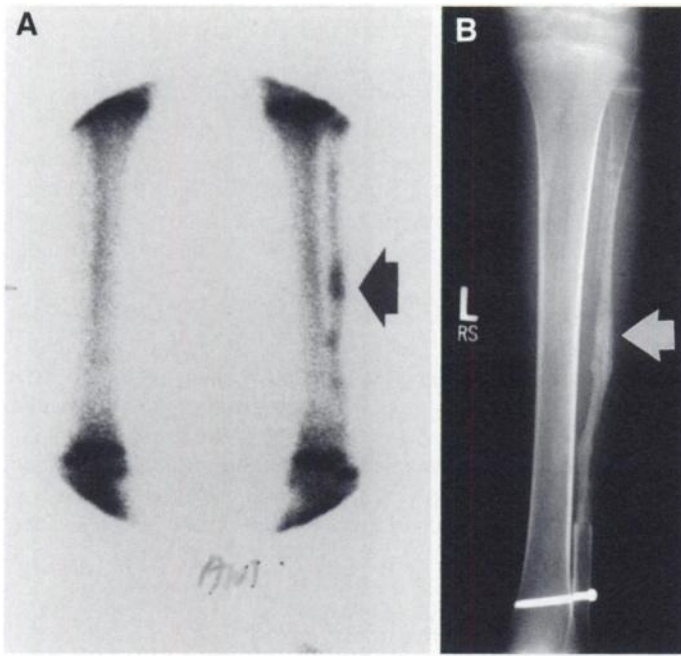


FIGURE 2. Technetium-99m skeletal scintigraphy in an 11-yr-old boy after resection of Ewing's sarcoma of the third lumbar vertebra and anterior strut fibular grafting. An anterior scintigram of the lower legs (A) obtained after the surgery shows increased radiotracer activity (arrow) along the left fibular donor site, with some focal increased uptake corresponding to the regenerated left neofibula (white arrow) on the frontal radiograph (B).

noted at the fibular donor site up to 9 mo later and was suggestive of regeneration of the donor fibula, which was confirmed by the radiograph. However, in Patient 1, irregular, ill-defined radiotracer activity was noted at the donor site and was initially presumed to be related to postoperative change; it subsequently disappeared 1 yr later. No regeneration of the donor fibula was noted on the radiograph. In Patient 3, no radiotracer activity was noted at 4 and 9 mo after the surgery, and the radiograph obtained at 9 mo showed no regeneration of the donor fibula. Patient 1 was 19 yr old, Patient 2 was 10 yr old and Patient 3 was 13 yr old. The differences in age may have



FIGURE 3. Anterior scintiphoto of the lower extremities in a 13-yr-old girl whose right fibula was used as a graft for the left tibia reveals increased uptake in the distal tibial shaft on the right (arrow) at the site of the syndesmosis. The proximal portion of the right fibula below the metaphysis shows reduced uptake, which correlates with radiographic evidence of osteopenia.

affected the regeneration process. We also found focally increased uptake at the site of distal tibiofibular fixation on the fibular donor site in all our patients; this is presumed to be due to stress in that region. Among the three patients, the one with the fibular regeneration showed the least increased uptake in the distal tibiofibular fixation; this is probably related to less stress in that region. Understanding these findings may be helpful in interpreting sequential skeletal scintigraphy in patients who have undergone limb salvage procedures.

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