Bone Scintigraphy in Scurvy

Dov Front, Ruth Hardoff, Joseph Levy, and Avraham Benderly

Rambam Medical Center and The Medical School of the Technion, Haifa, Israel

Scintigraphic bone changes in two cases of scurvy are described, the cause being subperiosteal hematoma. Generalized increased uptake was shown in the affected femur at an early stage of the disease. At a late stage, marked uptake both in the femoral shaft and surrounding tissue was seen causing scintigraphic appearance of widened ("club-shaped") femur.

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Scurvy is a rather rare nutritional disorder caused by vitamin C deficiency. Clinical findings in adults include swollen bleeding gums, follicular hyperkeratosis, petechiae, and joint effusion. In children, bone manifestations are prominent. The basic disturbance in scurvy is the failure of various types of connective-tissue cells to form and maintain collagenous matrices such as the collagen of fibrous tissue, osteoid, and dentin. This causes tendency to hemorrhage due to capillary fragility, which may affect the bone

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For reprints contact: Dov Front, Div. of Nuclear Medicine, Rambam Medical Center, Haifa, Israel.

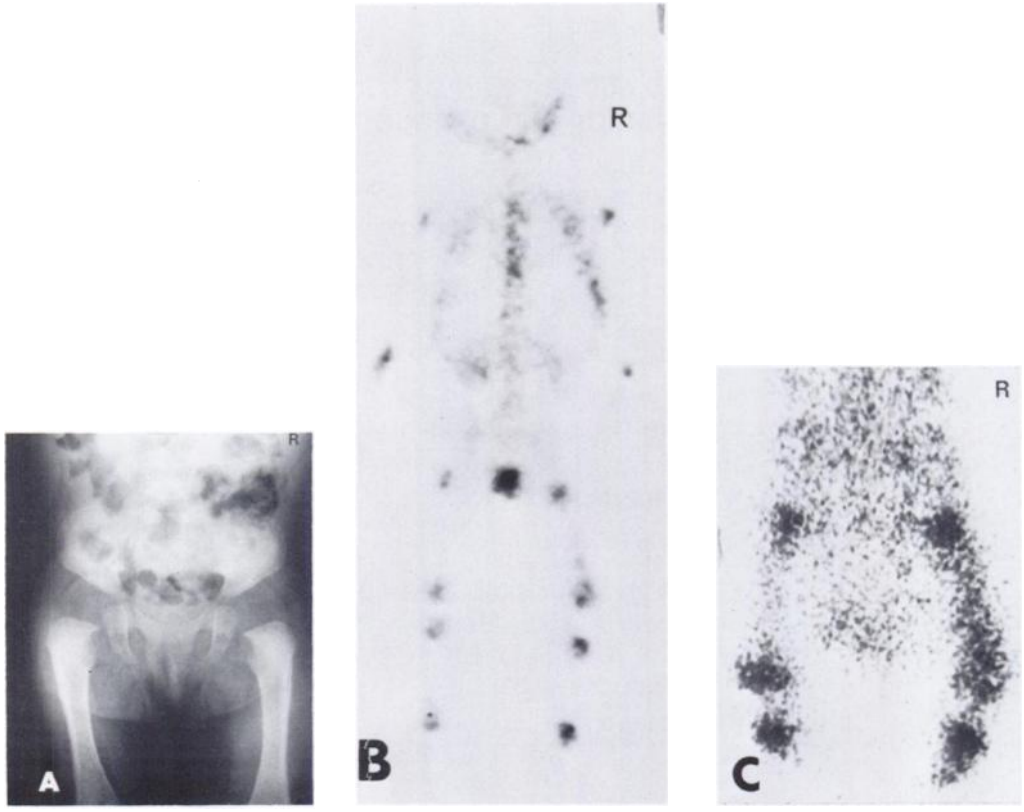

FIG. 1. Early radiographic and scintigraphic changes in scurvy. (A) Radiography of both femurs. Irregular, thickened, white line and underlying zone of rarefaction in metaphysis. Swelling of soft tissue of right thigh. (B and C) Bone scintigraphy with Tc-99m diphosphonate: increased uptake along shaft of right femur.

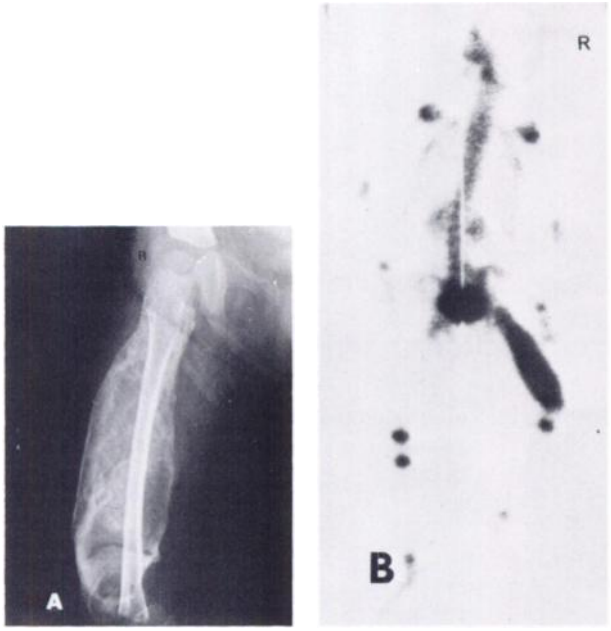

FIG. 2. Late radiographic and scintigraphic changes in scurvy. (A) Radiography of right femur. Calcifications representing organized subperiosteal hematoma. (B) Bone scintigraphy with Tc-99m methylenediphosphonate. Wide, club-shaped uptake along right femur.

(*1–3*). We report here two cases demonstrating scurvy changes as shown by bone scintigraphy.

CASE REPORTS

Case 1. An 8-month-old girl was admitted because of swelling and tenderness of the right thigh. Physical examination revealed a listless, malnourished, and febrile (39°C) baby. Her right thigh was swollen and tender but not hot, and the color of the skin was normal. Laboratory tests showed no evidence of infection. The disclosure that the child was fed only with milk cereals raised the possibility of vitamin C deficiency and subperiosteal hematoma in the right femur. Study of the fasting vitamin C level in the blood plasma showed 0.56 mg% (normal 0.6–1.2 mg%). Total vitamin C excretion in the urine in 24 hr was 8.5 (normal 20–30 mg/24 h). Radiography of the right femur (Fig. 1A) showed an irregular, thickened, white line at the metaphysis (Fraenkel's line), a zone of rarefaction under the metaphysis, and swelling of the soft tissues of the thigh.

Bone scintigrams with Tc-99m diphosphonate (Fig. 1B and C) showed increased uptake over the whole of the right femur. There was no deformation or widening of the bone. The child was treated with vitamin C and showed progressive improvement.

Case 2. A 4-year-old boy was admitted because of swelling of his limbs and multiple petechiae and hematomata over his skin without any history of trauma. The child was known to have cerebral palsy and severe psychomotor retardation. His diet also consisted only of milk cereals. The plasma vitamin C was 0.46 mg% and the 24-hr urinary excretion was 10 mg. Radiography (Fig. 2A) demonstrated a large calcified subperiosteal hematoma and slipped diaphysis in the right femur. Bone scintigraphy with Tc-99m methylenediphosphonate (Fig. 2B) showed markedly increased uptake in the right femur.

DISCUSSION

Bone changes in scurvy include, at the early stage, atrophy and disappearance of trabeculae causing a "ground glass" roentgenographic appearance. The cortex is thin and an irregular white line appears at the metaphysis—the Fraenkel line. Slipped diaphysis may occur. The bleeding tendency is also manifested in the bone. Subperiosteal hemorrhage is common, and during healing the elevated periosteum becomes highly calcified. The subperiosteal reaction to the hematoma causes absorption of the tracer, rather than the hematoma itself. The periosteum is probably highly vascular and the distribution of the Tc-99m diphosphonate reflects its increased regional blood flow. The scintigraphic findings in early and late subperiosteal hematoma are demonstrated in the above cases. In the early stage there is a generalized increased uptake along the shaft of the femur, without widening of the shaft, and when the hematoma becomes organized and calcified there is a markedly increased, club-shaped uptake.

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ERRATUM

A misprint appears in the article entitled "Tc-99m (Sn) Pyridoxylideneaminates: Preparation and Biologic Evaluation," by Makoto Kato and Masaaki Hazue (*J Nucl Med* 19: 397-406, 1978).

The 19th line from the top of p. 405 should begin with the words "imine stability," rather than "amine stability."