jnm/CASE REPORT

^{99m}Tc-POLYPHOSPHATE CONCENTRATION IN A NEUROBLASTOMA

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A 9-month-old girl showed concentration of the ^{99m}Tc-polyphosphate complex in an adrenal neuroblastoma. There was no uptake in the salivary or thyroid glands.

Technetium-99m-polyphosphate bone scanning (*1*) is a useful technique for the early detection of metastatic bone disease. Infrequently, uptake in extraosseous soft tissues has been noted (*2,3*). Intense concentration in an adrenal neuroblastoma is described in this report.

CASE REPORT

A 9-month-old girl was admitted for evaluation of an abdominal mass found on a routine well-baby visit. The child was asymptomatic and there was no pertinent past history. At physical examination there was a hard lobulated mass extending from the right costal margin to the right lower quadrant; no other abnormalities were noted. Laboratory data including CBC, urinalysis, SMA 6, SMA 14, urinary VMA, and bone marrow aspirate were all normal. X-ray film of the chest and metastatic bone survey were normal. The IVP showed an 8-cm-diam right upper quadrant mass with stippled calcifications throughout. There was extensive inferior draping of the pelvicalyceal system of the right kidney, with inferior displacement of the kidney itself. The left kidney was normal (Fig. 1). The IVP was felt to be consistent with an intrarenal Wilm's tumor with somewhat atypical calcifications but an extrarenal neuroblastoma showing rather uncommon major distortion of the renal pelvicalyceal system could not be excluded. The ^{99m}Tc-polyphosphate bone scan (2.5 mCi ^{99m}Tc-polyphosphate New England Nuclear Kit, 3-hr delay, Pho/Gamma HP camera) showed intense concentration of the radiopharmaceutical in the right upper quadrant mass (Fig. 2). The skeleton showed normal concentration with no uptake in the thyroid or salivary glands. At surgery the mass was extrarenal, well encapsulated, and was readily dissected free of the upper pole of the right kidney. The kidney was not removed. Final pathologic diagnosis was neuroblastoma with differentiation toward sympathicoblasts, probably arising in the right adrenal gland. The child was discharged on the seventh postoperative day.

DISCUSSION

Nonosseous uptake of ^{99m}Tc-polyphosphate has been noted occasionally in areas of roentgenographic soft-tissue calcifications. Included are areas of pulmonary calcifications in chronic dialysis patients and certain tumors with calcifications, including ganglioneuroma (*4*). We have seen several instances of uptake corresponding to femoral arteries showing calcification of the media. The present adrenal neuroblastoma showed abundant stippled calcifications throughout. However, soft-tissue concentration of ^{99m}Tc-polyphosphate in areas without roentgenographic calcification has been noted in cerebral infarction (*2*), and in pleural effusions, cellulitis, in the muscle necrosis of paroxysmal hemoglobinuria (*4*), and in osteogenic sarcoma metastic to lung (*3*). We have seen marked concentration in a contusion of the thigh.

The binding of ^{99m}Tc-polyphosphate to the inorganic matrix of bone has not been completely worked out but is apparently dependent on regional bone blood flow, and may be related in part to the small amount of tin in the polyphosphate complex (*1,5*). The mechanism of soft-tissue concentration of the ^{99m}Tc-polyphosphate complex is certainly not clear. Perhaps a local derangement of calcium metabolism,

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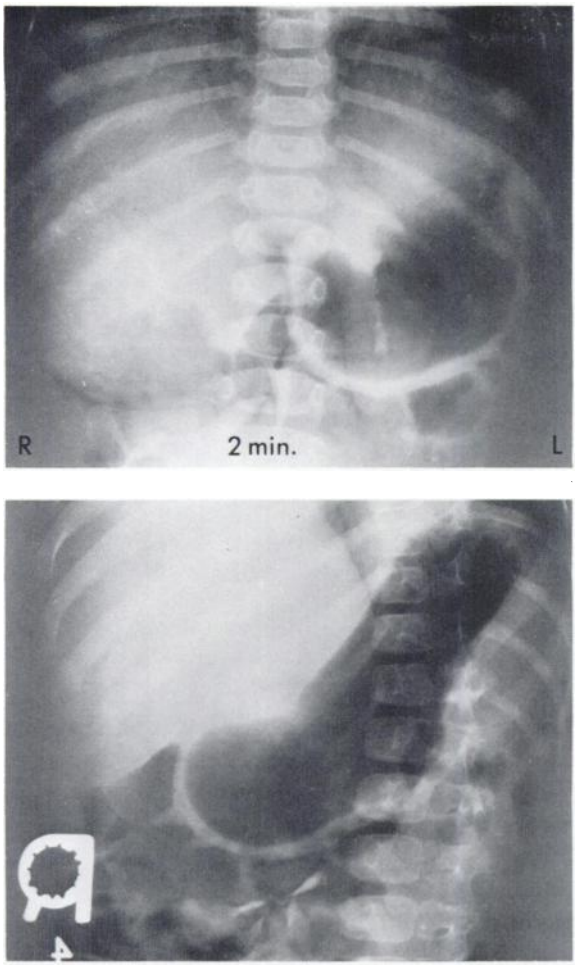

FIG. 1. AP and oblique films at 2 (top) and 4 (bottom) min after injection of contrast show stippled calcifications in large right upper quadrant mass. Draping and displacement of calyces of right kidney are evident. Left kidney is normal.

not necessarily manifest roentgenographically, is the underlying cause. In the present case, the soft-tissue uptake was not due to free ^{99m}Tc since there was no uptake demonstrated in the thyroid or salivary glands.

It is tempting to connect the roentgenographic soft-tissue calcifications with the concentration of the ^{99m}Tc-polyphosphate complex. If this association were valid, it might be of use in the localization of neuroblastoma, the most common solid tumor of childhood (*6*). Roentgenographic calcifications are present in many of these tumors with an incidence of about 50% in neuroblastomas of adrenal origin (*7*). Extra-adrenal neuroblastomas apparently have a lower incidence of calcifications (*8*) and calcifications within metastatic neuroblastoma are quite rare (*9,10*). Differentiation between intrarenal Wilm's tumor and extrarenal adrenal neuroblastoma may be difficult roentgenographically (*11*), as shown by the present case.

Scan localization of metastatic neuroblastoma in bone has been accomplished in four children using the capacity of the tumor to synthesize cystathionine from ^{75}Se-selenomethionine through homocysteine (*12*). No definite soft-tissue uptake was demonstrated. Replacement of normal bone marrow by metastatic neuroblastoma has been shown by reticuloendothelial scanning with ^{99m}Tc-sulfur colloid (*13*).

Extraosseous concentration of radiostrontium has been documented in a variety of conditions (*14*), including a primary posterior mediastinal neuroblastoma (*15*). It has been suggested that radiostrontium may even have some specificity for tumor cells (*16*). However, radiostrontium and the ^{99m}Tc-polyphosphate complex may have quite different mechanisms of tissue binding.

Further experience is needed to determine the possible diagnostic significance of the intense concentration of ^{99m}Tc-polyphosphate in the adrenal neuroblastoma described in this report.

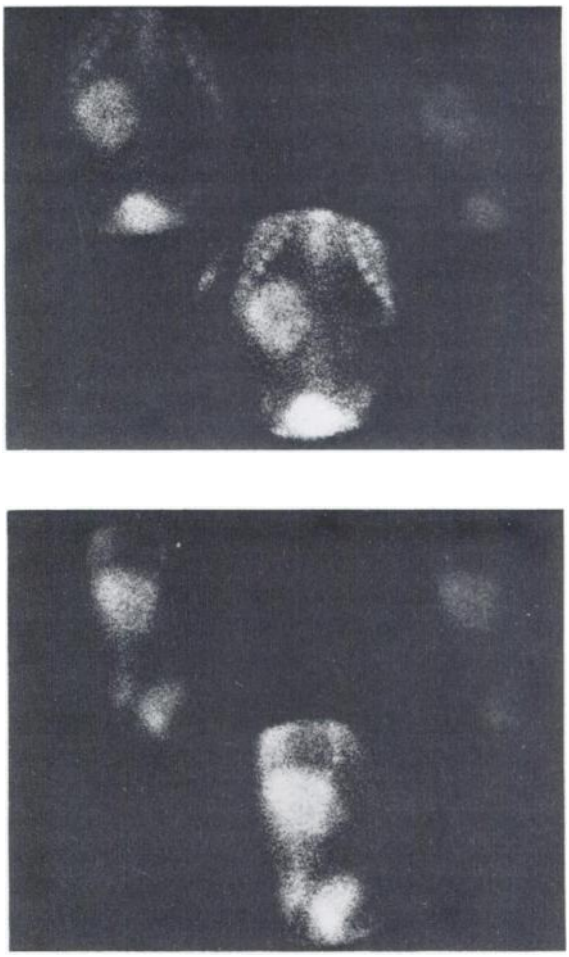

FIG. 2. Anterior (top) and right lateral (bottom) scans show intense right upper quadrant concentration of ^{99m}Tc-polyphosphate. Midline pelvic activity is bladder.

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