

## OVARIAN CARCINOMA IMAGED BY

### <sup>99m</sup>Tc-PYROPHOSPHATE: CASE REPORT

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*An ovarian carcinoma which avidly accumulated <sup>99m</sup>Tc-pyrophosphate was imaged during a bone scan. The primary tumor and its implants over the liver surface were both visualized. Although imaging of such an ovarian malignancy has not been previously reported, it offers a potential method for assessing neoplastic size and spread.*

Technetium-99m-pyrophosphate uptake occurred in a calcified papillary serous cystadenocarcinoma of the ovary in a 22-year-old woman. Additional accumulation may have occurred in tumor implants over the liver surface. This extraosseous tumor accumulation of a bone-seeking radiopharmaceutical correlated with the tumor's known location and broadened the spectrum of clinically useful information resulting from a "bone scan".

#### CASE REPORT

A 22-year-old nulligravida woman with normal menses had a 9-week history of progressive abdominal fullness and left flank pain. Physical examination revealed a huge lower abdominal mass extending to the umbilicus which had not been present during a pelvic examination 9 months previously. Her only significant previous illness was chronic pyelonephritis which had necessitated a right nephrectomy 8 years ago.

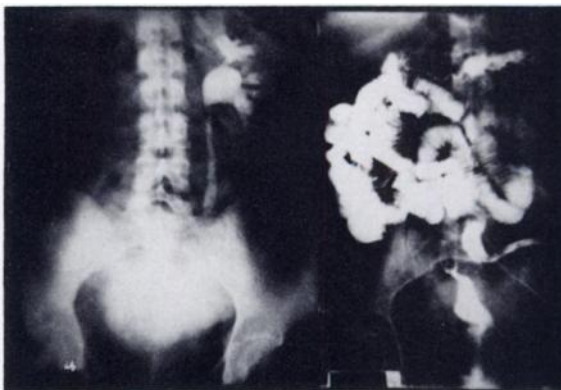
An intravenous pyelogram (Fig. 1) showed mild obstruction of the left kidney due to ureteral compression by a large finely calcified pelvic mass located above the bladder. A barium enema revealed superior displacement of the rectosigmoid colon by the mass. At surgery a 30-cm tumor was discovered in the lower abdomen extending from the pelvis. It was attached to the sigmoid colon, ileum, and omentum and involved the liver and urinary bladder sur-

faces. A biopsy specimen of the nonresectable mass was interpreted as papillary serous cystadenocarcinoma of the ovary with psammoma bodies.

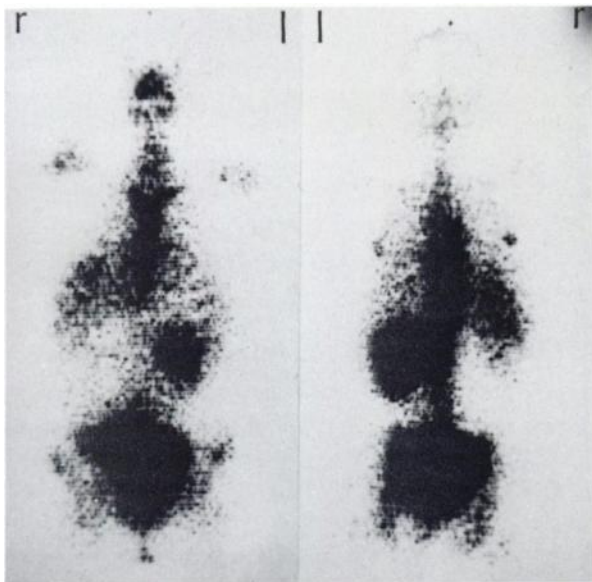
A postoperative bone scan (Fig. 2) performed with 15 mCi of <sup>99m</sup>Tc-pyrophosphate revealed striking pelvic radiopharmaceutical uptake in a distribution conforming to the radiographic configuration of the calcified mass. As would be expected, the radionuclide accumulated in the partially obstructed left kidney. However, additional radionuclide uptake occurred in the hepatic area; this was attributed to accumulation within the tumor (known to involve the liver surface). A liver-spleen scintigram performed with 4 mCi of <sup>99m</sup>Tc-sulfur colloid was normal. The patient's serum uric acid level of 8.0 mg% (normal is 2.5-5.9 mg%) was elevated but the blood urea nitrogen, serum creatinine, and liver

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**FIG. 1.** Intravenous pyelogram showing mild obstruction of left kidney and huge finely calcified pelvic mass. Barium enema revealed rectosigmoid displacement by tumor.



**FIG. 2.** Technetium-99m-pyrophosphate bone scan performed 3 hr after injection showed marked nuclide uptake by pelvic mass, right upper quadrant accumulation in site of known tumor implants, and excessive nuclide concentration in kidney as expected with partial renal obstruction (anterior on left, posterior on right).

function tests (total serum protein, albumin, total bilirubin, alkaline phosphatase, LDH, and SGOT) were normal. Thereafter radiation therapy to the pelvis was initiated.

#### DISCUSSION

Extrasosseous tumor uptake of bone-scanning agents has occurred in many neoplasms, both benign and malignant. This phenomenon is not confined to any particular scanning agent and is not simply a result of increased tumor vascularity. Indium-113m-transferrin blood pool scans performed by Chaudhuri, et al (1,2) did not show an increased tumor blood pool in patients with metastatic carcinoma of the colon or rectum despite avid tumor accumulation of  $^{99m}\text{Tc}$ -polyphosphate and  $^{87m}\text{Sr}$ . Previous reports have often stressed the presence of tumor calcification with the implication that this accounts for the localization of bone-scanning agents. Schall, et al (3) performed autoradiography on a pulmonary metastasis of osteogenic sarcoma and showed osteoblastic activity around mineralized osteoid in which there was prominent  $^{85}\text{Sr}$  deposition. However, tumor calcification is not a universal feature as evidenced by radionuclide uptake in necrotic, but noncalcified metastatic carcinomas of the colon, lung, and breast. Calcium phosphate deposition, in a proportion simi-

lar to that found in bone, frequently occurs in dead or dying tissue, and perhaps this accounts for the uptake of bone-scanning agents in such regions. On the other hand, cases have been reported in which neither calcification nor necrosis was evident, bringing up the possibility that bone-scanning agents have an inherent tumor-seeking potential (2). Even more confusing are reports of inconsistent radionuclide uptake in apparently identical tumors (4), as well as similar accumulations within malignant and apparently normal breast tissue (5).

The uptake of  $^{99m}\text{Tc}$ -pyrophosphate in the papillary serous cystadenocarcinoma of the ovary in this patient was probably related to the calcification present. Radionuclide accumulation in the hepatic region raises the possibility of its uptake by tumor implants on the liver surface which were not detected by liver-spleen scintigraphy. Ovarian accumulation of radionuclide has not been utilized for external imaging in humans except by Yeh, et al (6) who visualized struma ovarii using  $^{131}\text{I}$  and  $^{99m}\text{Tc}$ -pertechnetate. To the author's knowledge this is the only report of a primary ovarian carcinoma to be externally imaged using a radionuclide. Papillary serous cystadenocarcinomas of the ovary frequently calcify in both primary and metastatic sites, and thus bone scanning is a potential means of assessing neoplastic size and spread.

#### ACKNOWLEDGMENT

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