METASTATIC THYROID CARCINOMA EVALUATED WITH RAPID SCINTIPHOTOGRAPHY

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Rapid scintiphotographic studies with ^{99m}Tc-pertechnetate and the Anger scintillation camera have been used to visualize major blood pathways as well as the vascularization (or the lack thereof) in various body organs. Functioning metastatic thyroid disease would appear to be a particularly useful area for this technique since one is able to visualize both the early vascularization of the lesion and the later trapping of the pertechnetate by the functioning thyroid tissue. The method used is similar to what has been described previously in other areas (*1,2*).

CASE REPORT

A 66-year-old female entered the Bronx Municipal Hospital Center in August 1967 with severe left hip pain of 2-weeks duration. She had undergone thyroid surgery for a "tumor" 8 months earlier in her native Ecuador. On physical examination, she had a 12.5 × 10-cm hard, non-mobile, tender mass in the left lower quadrant of the abdomen. It could not be separated from the iliac bone.

Thyroid studies on admission indicated a euthyroid state. Her protein-bound iodine was 6.5 μg/100 ml, and her T_3 resin sponge uptake was 28%. There were no clinical signs or symptoms of thyrotoxicosis.

An x-ray of the pelvis revealed an area of sclerosis in the ilium with an associated fracture above the left acetabulum. A ^{99m}Tc-pertechnetate rapid scintiphotographic study revealed the mass to be highly vascular (Fig. 1). A delayed 5-min study showed considerable activity in the mass with little residual

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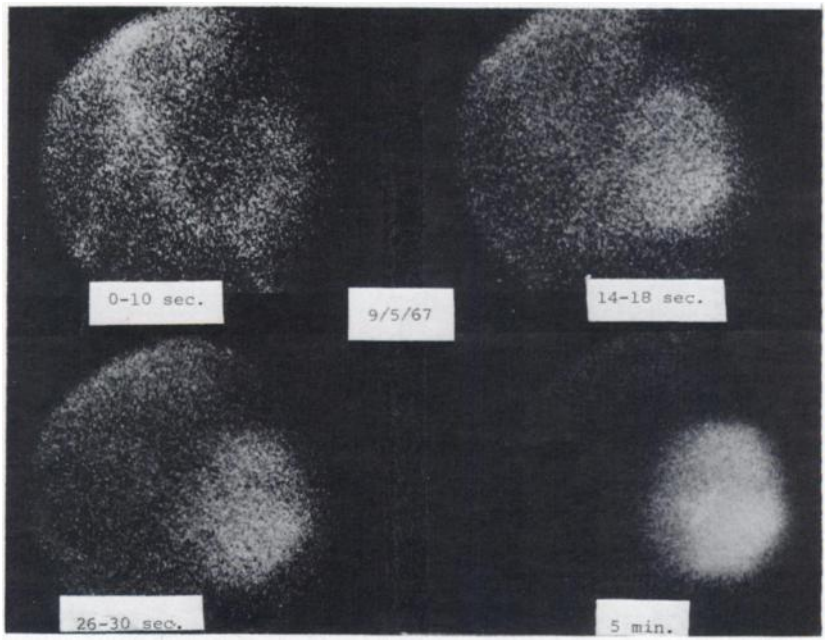

FIG. 1. Scintiphotographic study of left pelvic mass after 10-mCi intravenous bolus of ^{99m}Tc-pertechnetate. Zero to 10-sec exposure shows bifurcation of aorta and early vascularization of mass. Fourteen to 18- and 26–30-sec exposure shows progressive increase in mass activity. A 300-K exposure at 5 min reveals intense activity in mass with very little residual background activity. This probably represents, in part, actual trapping of pertechnetate by this functioning thyroid metastasis.

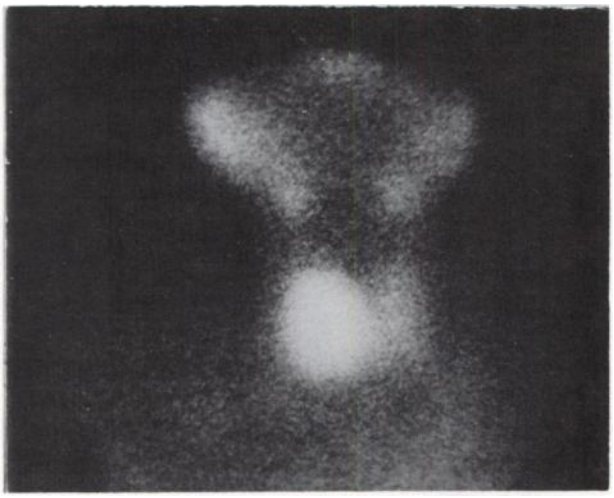

FIG. 2. Neck study performed immediately following dynamic study in Fig. 1. No additional ^{99m}Tc-pertechnetate was administered. Right thyroid lobe appears normal. Markedly reduced left-sided activity is secondary to partial thyroidectomy performed 8 months earlier. Salivary glands are well visualized at upper portion of scintiphoto.

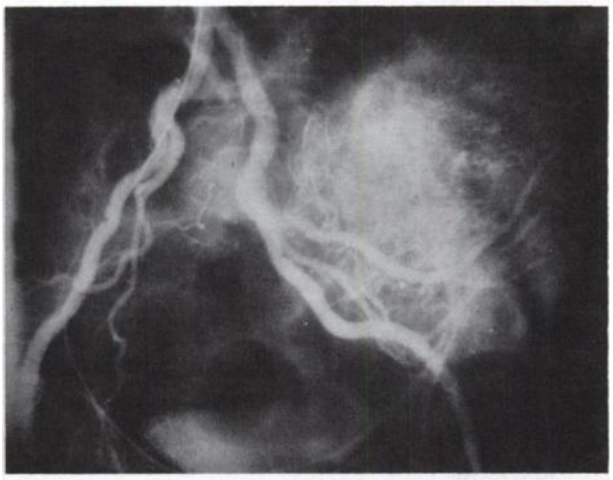

FIG. 3. Angiogram of left pelvic mass. Large vascular lesion with many small serpiginous vessels as well as generalized tumor blush is demonstrated. Multiple films obtained in study clearly showed major vascular supply of lesion was from left hypogastric and lower lumbar arteries. Note excellent correlation of this study with scintiphotographic study.

background activity (Fig. 1). A scintiphotograph of the neck (Fig. 2) showed a normal right thyroid lobe and only a small amount of left-sided activity. A pelvic angiogram (Fig. 3) demonstrated a large vascular mass supplied by the left hypogastric and lower lumbar arteries. One hundred microcuries of ^{131}I was administered orally and a 24-hr scan of the mass revealed intense activity (Fig. 4). The actual uptake in the mass was 40% while the remaining thyroid in the neck had only a 9% uptake. A 48-hr urinary collection recovered only 18% of the administered dose.

Because of the patient's poor general condition and the very favorable concentration of radioiodine in the pelvic lesion, further thyroid surgery was not performed. One hundred thirty-five millicuries of ^{131}I was administered in late September 1967. About 2 weeks later, she was placed on daily thyroid extract for TSH suppression.

Over the next 4 months, the patient did quite well. Her pain was considerably relieved and the left pelvic mass was reduced to 3 cm. A repeat ^{99m}Tc-pertechnetate dynamic study demonstrated the marked reduction in the size of the mass (Fig. 5). Repeat ^{131}I studies showed a reduction in uptake of the mass to 7%. The thyroid itself was now trapping 19% of the radioiodine. The maintenance thyroid medication had been discontinued 3 weeks prior to reevaluation.

The patient did well for an additional 6 months but then developed multiple metastatic foci elsewhere. Despite supportive therapy and one additional course of ^{131}I therapy, her condition continued to deteriorate and she expired. An autopsy was not performed.

BRIEF COMMENT

The ability of metastatic thyroid lesions to trap ^{99m}Tc-pertechnetate was demonstrated first by Sodee with the use of conventional rectilinear scanning (*3*). Carr, et al recently reported concentration of the same radiopharmaceutical in metastatic papillary carcinoma in neck nodes (*4*). The use of the Anger scintillation camera allows one to study the vascularization of the lesion in addition to its trapping ability. The excellent correlation between the radionuclide and radiographic angiogram again demon-

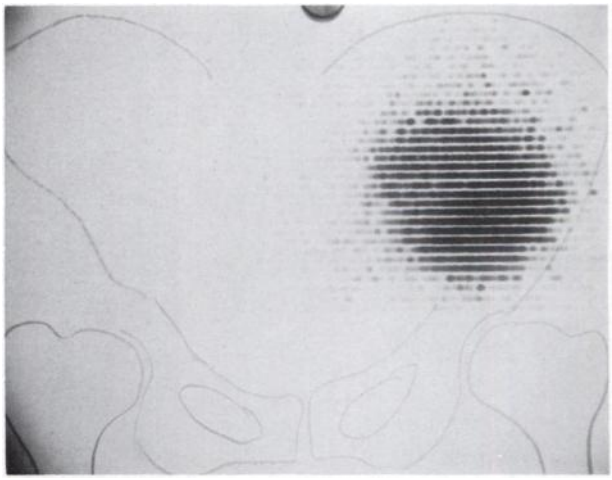

FIG. 4. Iodine-131 study of left pelvic mass. Twenty-four hours after oral dose of 100 μCi of ^{131}I, pelvic scan revealed considerable uptake of radioiodine in mass. This was unusual finding considering that most of original thyroid gland was still present. By actual count, left pelvic mass was trapping 40% of radioiodine while thyroid itself was trapping only 10%. Ability of mass to trap radioiodine confirmed fact that lesion was metastatic thyroid deposit.

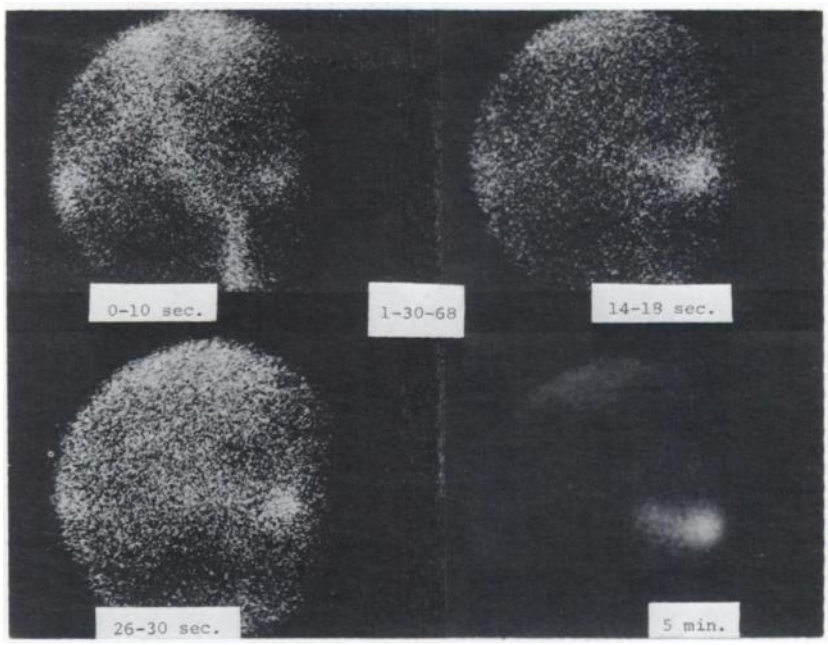

FIG. 5. Scintiphotographic study of left pelvic mass 4 months after therapeutic dose (135 mCi) of ^{131}I. Serial exposures show considerable reduction in size and vascular supply of mass. Technique and time of each exposure is identical to pretreatment camera study. This allows easy comparison of two examinations.

strates the great amount of information that can be obtained with such intravenous scintiphotographic techniques. It also provides the confidence needed to use this safe and easy-to-perform procedure to follow the course of patients with a similar type of problem.

ACKNOWLEDGMENT

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REFERENCES

1. FREEMAN LM, MINDELZUN R: Diagnosis of aortic aneurysm with radionuclide angiography. *Amer J Surg* 116: 433–436, 1968

2. FREEMAN LM, MENG C-H, BERNSTEIN RG, et al: Rapid, sequential renal blood flow scintiphotography. *Radiology* 92: 918–923, 1969

3. SODEE DB: The evaluation of metastatic thyroid carcinoma with Technetium-99m pertechnetate. *Radiology* 88: 145–147, 1967

4. CARR HA, TEMPLE TE, STAAB EV: Early visualization of ^{99m}Tc-pertechnetate in metastatic thyroid cancer in a patient with Graves disease. *J Nucl Med* 12: 40–42, 1972