SCINTIGRAPHIC EVALUATION OF LIVER METASTASES FROM THYROID CARCINOMA

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Thirty-one patients with carcinoma of the thyroid were evaluated using ^{131}I scan of the torso including the area of the liver. Focal areas of ^{131}I uptake were found in the liver in two patients with follicular thyroid carcinoma. Both patients showed associated abnormalities on ^{99m}Tc-sulfur colloid liver scans. The remaining 29 patients showed either no uptake or a normal diffuse pattern of ^{131}I uptake in liver. Careful evaluation of the liver is recommended on the radioiodine body scan for metastases in patients with thyroid carcinoma.

Radioiodine has been widely used in patients with thyroid carcinoma to detect functioning metastases (*1–5*). Functioning metastases in liver would be expected to appear as areas of increased uptake on radioiodine scan of torso and as filling defects on radiocolloid liver scan. The present study evaluates scintigraphic evidence of liver metastases in patients with thyroid carcinoma.

MATERIALS AND METHODS

From December 1970 through November 1973, 31 patients with thyroid carcinoma received radioiodine treatment and had pretreatment or posttreatment rectilinear torso scans that included the area of the liver. Pretreatment scanning doses ranged from 1.1 to 10 mCi ^{131}I. Treatment doses of ^{131}I ranged from 48 to 100 mCi.

Additional studies were obtained in patients whose ^{131}I torso scans showed increased uptake in the area of the liver. Liver scintiphotos were obtained after administration of 3 mCi ^{99m}Tc-sulfur colloid. Combined scintiphotos of the liver were also obtained by double-exposing Polaroid film at both ^{99m}Tc and ^{131}I settings following administration of both ^{99m}Tc-sulfur colloid and ^{131}I.

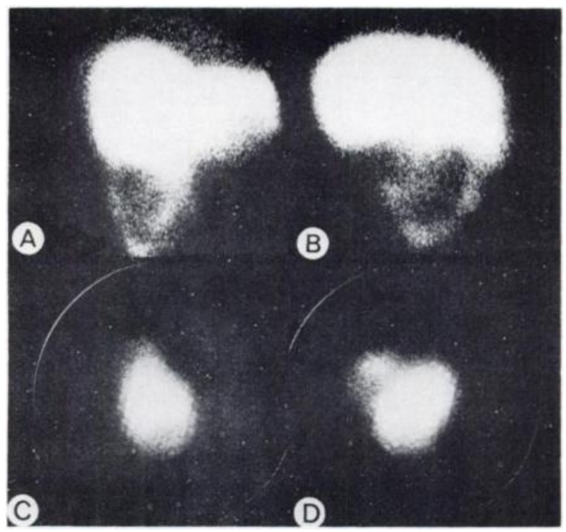

FIG. 1. (A, B) Anterior and right lateral ^{99m}Tc sulfur colloid scintiphotos of liver. Large filling defect is present in inferior portion of right lobe. (C, D) Anterior and right lateral liver scintiphotos following administration of 100 mCi ^{131}I. Uptake of ^{131}I is present in radiocolloid filling defect.

RESULTS

Scans over the area of the liver after ^{131}I administration showed either no uptake of ^{131}I in liver or a diffuse pattern of ^{131}I uptake in all patients except two who had focal accumulation of ^{131}I in liver. In the first of the two patients, an area of radioiodine uptake in liver coincided with a large filling defect on radiocolloid liver scan (Fig. 1). The patient was

Received Oct. 10, 1974; original accepted Jan. 26, 1975.

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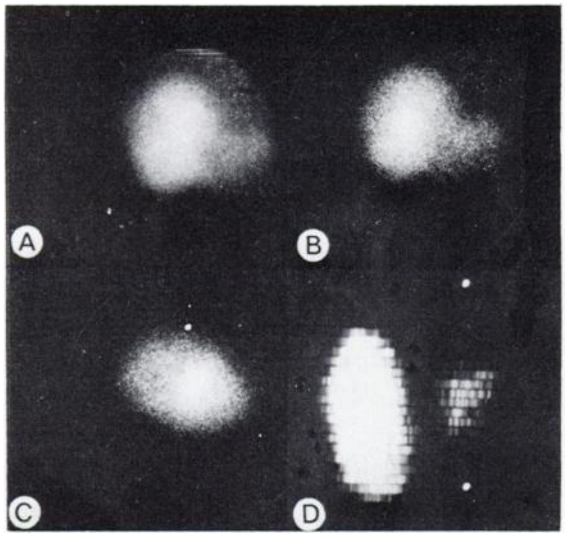

FIG. 2. (A) Anterior ^{99m}Tc-sulfur colloid scintiphoto of liver. Slight decrease in radiocolloid uptake is present in midportion of right lobe. (B, C) Anterior and right lateral scintiphotos of liver following administration of both ^{99m}Tc-sulfur colloid and ^{131}I. Scintiphotos were double-exposed at both ^{99m}Tc and ^{131}I settings, localizing ^{131}I uptake within liver. (D) ^{131}I thyroid scan. Residual functioning thyroid tissue is present in left lobe, with normal scan pattern in right lobe.

a 70-year-old woman with follicular carcinoma of the thyroid who had had a thyroidectomy followed by 100 mCi ^{131}I 6 months previously. The present study was performed after her second treatment dose of 100 mCi ^{131}I. Metastases to spine and pelvis were also demonstrated.

In the second of the two patients, a focal area of increased radioiodine uptake was present in liver in an area which showed decreased radiocolloid uptake. Liver uptake occurred even though an essentially normal scan pattern of the right lobe of the thyroid was still present (Fig. 2). The patient was a 70-year-old woman who had had a mass in the left lobe of the thyroid resected; the mass was found to be a poorly differentiated follicular carcinoma. The present study was performed after a scanning dose of 1.1 mCi ^{131}I. The patient died 2 weeks later; widespread metastases of follicular thyroid carcinoma were demonstrated at autopsy including extensive metastases to lungs and mediastinum that had not been demonstrated on radioiodine body scan. A poorly differentiated pattern was present in all metastases except in the liver where a well-differentiated follicular pattern was present (Fig. 3).

DISCUSSION

Relatively little information is available on the frequency of liver metastases from thyroid carcinoma. In one series, liver metastases developed in 3 of 180 patients with papillary carcinoma and in 1 of 88 with follicular carcinoma; 5 of 25 patients with anaplastic carcinoma had disseminated soft-tissue metastases (*6*). In another series of patients with thyroid carcinoma who were found at autopsy to have metastases, liver metastases were present in 3 of 18 patients with metastatic papillary carcinoma, in 4 of 18 with metastatic follicular carcinoma, in 4 of 8 with metastatic mixed papillary and follicular carcinoma, and in 24 of 63 with metastatic undifferentiated thyroid carcinoma (*7*).

Uptake of ^{131}I in areas outside thyroid, thyroglossal duct, salivary glands, esophagus or stomach, or ovary in struma ovarii, is evidence of thyroid metastasis (*8*). The diffuse pattern of ^{131}I uptake seen in some patients in liver presumably represents uptake of radioiodinated thyroid hormones or albumin that are normally taken up by liver (*9,10*) and should not be interpreted as thyroid metastasis. Focal areas of increased ^{131}I uptake in liver indicate the presence of functioning thyroid metastases. There was no difficulty in the patients studied in distinguishing between physiologic sites of radioiodine uptake and abnormal radioiodine concentration associated with organic synthesis in tumor tissue.

Liver scan after ^{131}I administration offers a technique for the differential diagnosis of focal hepatic lesions seen on radiocolloid scan in patients with thyroid carcinoma. Uptake of ^{131}I in the lesions demonstrates that they represent functioning thyroid metastases and implies that they will take up ^{131}I administered as a treatment dose. Failure to demonstrate uptake of ^{131}I in focal hepatic lesions does not exclude the presence of nonfunctioning thyroid metastases. The double-exposure scintiphoto technique using both ^{131}I and ^{99m}Tc-sulfur colloid offers a convenient method to establish that an area of in-

FIG. 3. Well-differentiated follicular thyroid carcinoma metastatic to liver. Microscopic section was obtained at autopsy.

creased radioiodine uptake in liver corresponds to an area of decreased radiocolloid uptake.

Thyroid ablation is not necessarily a prerequisite for demonstrating metastases as was shown in the second patient. However, the majority of metastases that take up radioiodine does so only after thyroid ablation (*5*). The more closely the histology of a thyroid carcinoma approaches the normal pattern, the more likely the carcinoma is to take up radioiodine (*11*). The prominent uptake of ^{131}I in liver in the second patient is consistent with the well-differentiated pattern of metastasis that was found in the liver at autopsy.

The focal hepatic lesion on radiocolloid scan was discrete and prominent in the first patient but was less distinct in the second patient. The focal area of radioiodine uptake was distinct in both patients. It is conceivable that scatter radiation from ^{131}I, which had been administered prior to the radiocolloid, may have partially obscured the focal lesion on the radiocolloid scan in the second patient. However, extrapolation of the findings in the second patient suggests that liver scan after ^{131}I administration may be more sensitive than radiocolloid scan in detecting functioning thyroid metastases in liver. Generally a "hot" lesion with "cold" surrounding tissue is more easily seen than a "cold" lesion surrounded by "hot" tissue. Focal uptake of ^{131}I may therefore be detectable before discrete lesions can be seen on radiocolloid scan.

It is recommended that the liver be carefully evaluated on the radioiodine body scan for metastases in patients with thyroid carcinoma.

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