Occasionally, malignant tumors form a parasitic relationship with surrounding organs, deriving their blood supply from vessels feeding that organ without histologic evidence of "invasion". Since radiopaque angiography relies upon identification of the feeding vessel to a tumor to define its location and origin, the true nature of a parasitic tumor may not be detected and a mistaken diagnosis of metastases to that organ made. This incomplete information might dissuade a surgeon from operating on a resectable tumor. In the diagnosis of malignant tumors in and around the liver, radioisotopic scintiangiography reveals filling of the tumor vessels resulting in a "vascular blush". In general, intrahepatic lesions associated with a vascular blush have a corresponding well-defined area of decreased radioactivity on the static scintiphotograph. However, a parasitic tumor may not produce a decrease in activity on the static scintiphotograph to correspond to the vascular blush on the scintiagram. This would indicate that the lesion was extrahepatic and, in conjunction with the radiopaque angiogram, indicate the true nature of the lesion. This phenomenon is reported in a patient with hypernephroma. Radiopaque angiography, radioisotopic scintiangiography, and static scintiphotography were performed and resulted in the proper preoperative diagnosis.

Clinical findings. The patient was a 51-year-old white woman who complained of right flank pain of several months duration. Recently she had noticed fatigue, weight loss, and night sweats. Physical examination revealed evidence of weight loss and a 10 x 10-cm mass in the right upper quadrant which moved with respiration.

Laboratory findings. A routine biochemical screen including BUN, serum creatinine, serum electrolytes, and urinalysis were normal except for a marked elevation in serum alkaline phosphatase. A chest x-ray was also normal. An excretory urogram revealed a large mass in the upper pole of the right kidney (Fig. 1A).

Radiopaque arteriography was performed using the percutaneous femoral approach of Seldinger (3). Selective right renal radiopaque arteriography demonstrated tumor vessels and tumor stain in the inferior portion of the large mass lesion in the upper pole of the right kidney (Fig. 1B). The upper portion of the tumor was avascular. Subsequent radiopaque arteriography of the celiac-superior mesenteric arterial trunk revealed a 3 x 4-cm mass lesion in the region of the inferior portion of the right lobe of the liver (Fig. 1C). Tumor vessels and tumor stain were also identified in this lesion. The diagnosis of

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FIG. 1. (A) Excretory urogram demonstrates large mass in upper pole of right kidney (t) displacing kidney downward. (B) Selective right renal arteriogram demonstrates tumor stain and vascularity in inferior portion of mass lesion (t). (C) Superior mesenteric arteriogram demonstrates mass lesion (t) supplied by branch of right hepatic artery (h). Tumor stain and vascularity are in region of inferior border of right lobe of liver. Splenic artery (s) is also seen.

A vascular tumor, most probably a hypernephroma with metastases to the liver, was made.

Hepatic scintigraphy and scintiangiography. The hepatic scintiograms were obtained using a scintillation camera. Ten mCi of $^{99m}$Tc-sulfur colloid were injected as a bolus into an antecubital vein by Oldendorf's technique (4). Upon delivery of the bolus, 35-mm scintiphotographs were obtained at 2-sec intervals for the ensuing 40 sec. Simultaneously, Polaroid films were pulled manually, the first exposure representing the interval from 0 to 6 sec postinjection and the subsequent seven exposures were each of 2-sec duration. One minute postinjection both the 35-mm and Polaroid films were exposed to accumulate 500,000 counts with the patient in the same position. This image was obtained to localize the anatomy for subsequent comparison with events seen on the dynamic portion of the study and is called the “positioning film”. This technique was described by DeNardo, et al (5). The static hepatic scintiphotographs were obtained 30 min postinjection and included anterior, posterior, and right lateral views of the liver and anterior and posterior views of the spleen. Each image was obtained with 500,000 counts and took approximately 1 min.

The hepatic scintiagram (Fig. 2A) demonstrates radioactivity in the aorta (2-4-sec image) which indicates the beginning of the arterial phase of the study. The first appearance of radioactivity in the aorta is designated as zero time. An area of increased radioactivity (arterial blush) is seen in the location of the right kidney with a smaller blush superior to it which abuts on the inferior border of the right lobe of the liver. The superior and inferior blushes are separated by an area of decreased radioactivity representing avascularity. This area remains avascular throughout both arterial and venous phases of the study. The static hepatic scintiphotographs show a liver of normal size with no intrinsic defects (Fig. 2B). The lower border of the right lobe is unusually concave; this concavity was felt to represent either a normal anatomic variant or an extrinsic mass impinging on the liver. The study was interpreted as being consistent with a right renal vascular mass lesion with no evidence of liver metastases.

Surgical findings and course. A large, encapsulated mass was found in the superior pole of the right kidney adherent over an area of $4 \times 5$ cm to the inferior portion of the right lobe of the liver lateral to the gallbladder. The liver appeared normal. A right nephrectomy was performed and because of the radiopaque angiographic appearance of liver involvement, a partial wedge resection of the right liver lobe was also performed. Gross and histologic examination of the resected tissue revealed a well-encapsulated renal cell carcinoma originating in the right kidney and extending to the liver. The resected portion of the liver showed no evidence of invasion. The tumor had a large central area of necrosis. The patient was followed with serial hepatic scintiphotographs and hepatic scintiagrams. No hepatic lesions were seen apart from alterations of configuration of the liver incident to the surgical resection. The patient died 5 months after surgery with extensive lung metastases. At autopsy, gross and histologic examination of serial sections of the liver showed no evidence of neoplastic disease.

DISCUSSION

The phenomenon of tumor parasitism has been described in several neoplasms including adrenal (1,3,6) renal (1,7) and hepatic neoplasms (1,8) and at least two mechanisms may be involved: (A) Chronic inflammation, which is frequently associated with neoplasms, can result in well-vascularized adhesions to surrounding structures and may play a
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To differentiate the parasitic tumor from a metastasis, but these methods are costly, require multiple injections of radiopaque material, and are therefore not routinely performed.

The fact that no intrahepatic lesion could be seen on the static scintiphotograph to correspond to the arterial blush seen on the hepatic scintangiogram was evidence that the lesion was extrahepatic. When the radiopaque angiogram indicated that the blood supply of the lesion was partly obtained from the hepatic arterial system, it became apparent that the tumor was parasitic. Rarely will this conclusion be in error because there have been rare reports of hepatic neoplasms which retain their functional integrity and thus do not appear as a cold area on the static scintiphotograph but do cause a vascular blush on the scintangiogram (12).

This case adds further evidence for the important role of hepatic scintigraphy and scintiography in the investigation of patients with malignant tumors in and around the liver.

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REFERENCES

Hepatic Scintiangiography in Malignant Parasitic Tumors
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