INDIUM-113m PERFUSION STUDY AND THE NONFUNCTIONING THYROID NODULE

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Indium-113m eluate has been used to study the perfusion of 12 patients with solitary thyroid nodules that appeared "cold" in the ^{131}I and ^{99m}Tc image studies. Seven patients with colloid nodules showed no perfusion and the remaining five (three adenomas and two carcinomas) showed good perfusion with indium. Histologic confirmation was obtained in all cases. Indium-113m perfusion study may be useful in differentiating colloid nodules from either adenomas or carcinomas.

Since 20–30% of solitary nonfunctioning nodules on the thyroid scan are malignant (*1–3*), identification of these nodules by scintigraphy is of great clinical importance. Encouraged by results that ^{113m}In perfusion liver imaging with radiocolloids significantly differentiates hepatoma from "cold" benign lesions (*4*), we evaluated ^{99m}Tc thyroid scans and ^{113m}In perfusion studies for the differentiation of such solitary cold lesions as thyroid carcinoma or adenoma from colloid nodules.

METHOD

Between March 1974 and May 1975, 12 patients with thyroid nodules were selected for evaluation. Inclusion in the study was determined by the following criteria:

1. A single "cold" nodule was identified by scintigraphic examination 24 hr after oral ingestion of ^{131}I.
2. Histologic identification of the tissue was possible.

Each patient was given 5 mCi of ^{99m}Tc-pertechnetate intravenously (*5*) and 20 min later the thyroid was imaged using a scintillation camera fitted with a pinhole collimator (*5–7*). The images were obtained on Polaroid film. The first, unmagnified image was taken by accumulating 100,000 counts, with the face of the collimator kept 17.25 cm from the patient's neck. For the second image, the collimator face was placed so that the thyroid image almost filled the crystal area. Then, without changing the patient's position, another scintiphoto was taken immediately after intravenous injection of 4–7 mCi of ^{113m}In eluate with the same scintiphotographic parameters, except that the spectrometer setting was changed from 140 keV for ^{99m}Tc to 397 keV for ^{113m}In. Each scintiphoto accumulated 100,000 events. Each ^{99m}Tc-pertechnetate scintiphoto was compared with a ^{113m}In perfusion image, and the perfusion was classified as either good or absent (Figs. 1 and 2).

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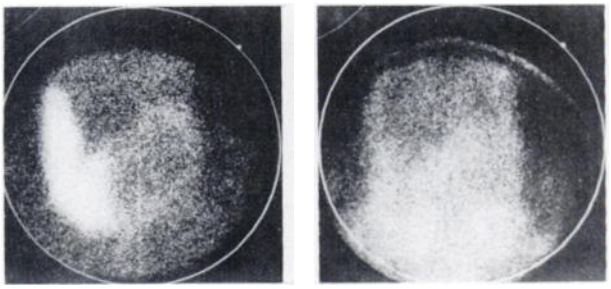

FIG. 1. Case 1. Technetium-99m-pertechnetate thyroid scintigraph (left) shows cold mass in left lobe. Indium-113m perfusion image (right) shows good perfusion of corresponding cold lesion (follicular adenoma).

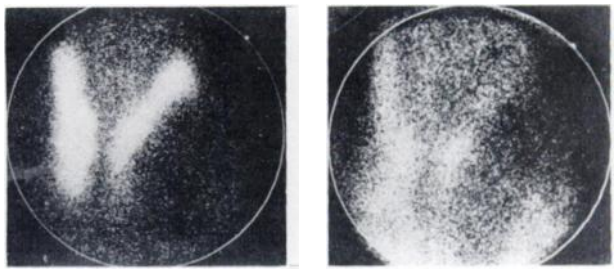

FIG. 2. Case 2. Technetium-99m-pertechnetate thyroid scintigraph (left) shows cold mass in left lobe. Indium-113m perfusion image (right) shows no perfusion of corresponding cold lesion (colloid nodule cyst).

TABLE 1. PATIENT DATA RELATING TO ^{113m}In PERFUSION IMAGING

Patient	Age	Sex	% ^{131}I RAIU 24 hr	^{113m}In perfusion study	Histopathologic diagnosis
1. K IF	22	M	27	Good	Follicular adenoma
2. H YC	24	F	33	Good	Follicular adenoma
3. H FK	31	F	15	Good	Papillary adenoma
4. L CL	41	F	29	Good	Papillary adenocarcinoma
5. N HI	49	M	25	Good	Anaplastic carcinoma
6. W SC	58	M	28	Absent	Colloid nodule
7. H K	34	F	43	Absent	Colloid nodule
8. Y EE	23	F	17	Absent	Colloid nodule
9. L PS	36	M	26	Absent	Colloid nodule
10. Y HT	47	M	22	Absent	Colloid nodule
11. L FM	30	F	33	Absent	Colloid nodule
12. L SL	28	F	41	Absent	Colloid nodule

RESULTS

The correlation between the histologic diagnosis and assigned degree of perfusion is summarized in Table 1. All seven absent-perfusion nodules were colloid cysts. In contrast, all five nodules showing good perfusion were either carcinoma or adenoma. Three were adenomas (two follicular, one papillary) and another two cases, carcinoma (one papillary adenocarcinoma and one anaplastic).

DISCUSSION

A number of scintigraphic investigations have attempted to differentiate the malignant thyroid tumor from the benign cold nodule. Complementary scanning with ^{75}Se-selenomethionine and ^{131}I has resulted in no false-negative result in one study (*6*) and a 24% incidence of false-negative scans in another study (*7*). Kaplan, et al (*8*) reported that, of seven patients with proven thyroid cancer, only two cases of anaplastic carcinoma and one case of pap-follicular adenocarcinoma were positive in thyroid scans using ^{67}Ga-citrate.

Thyroid nodular cysts are devoid of vascularity, while carcinoma or adenoma of the thyroid is as vascular as carcinoma of the liver (*9*). Obviously, ^{113m}In liver perfusion imaging is applicable in the evaluation of thyroid nodules (*4*). Our preliminary results were satisfactory. Although carcinoma and adenoma of the thyroid could not be differentiated in this study, we have found that it offers a useful aid in making the crucial distinction between solitary colloid nodule cyst and adenoma or carcinoma.

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