EVALUATION OF COLD AREAS ON THE THYROID SCAN WITH ^{67}Ga-CITRATE

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Cold areas on ^{131}I or ^{99m}Tc thyroid scans were re-evaluated using ^{67}Ga-citrate in 134 patients. In 62 patients surgical specimens were obtained for histologic studies. Of 46 benign lesions, all had negative ^{67}Ga scans, and ^{67}Ga scans in 5 of the 16 lesions judged to be malignant were positive. It was thought that the sensitivity of the method did not warrant its use for routine screening in evaluations of malignancy of thyroid nodules.

The recent report by Kaplan, et al (*1*) has prompted us to present our own experience with ^{67}Ga-citrate imaging of nonfunctioning thyroid nodules in a much larger patient series.

PATIENTS AND METHODS

One hundred and thirty-four patients with one or more cold areas on the ^{131}I or ^{99m}Tc scan were given 2.5 mCi of ^{67}Ga-citrate intravenously. Scanning of the thyroid was performed 3 or 4 days later with a scintillation camera (Searle Radiographics), fitted with an ordinary pinhole collimator, using the 0.093-MeV photopeak and a 15% window. A total of 100,000 counts was collected. The results were visually assessed by two of the authors independently. Echography of the thyroid (*2*) was performed in several cases to differentiate a solid tumor from a cyst. If with this technique the nodule proved to be cystic, it was not studied with ^{67}Ga because cysts are very seldom malignant (*2*).

RESULTS

No tissue was available for pathologic examination on 72 of the 134 patients examined, mostly because they had not undergone surgery. Only one of these cases showed a clearly positive ^{67}Ga-citrate scan. The remaining sixty-two patients were operated on and the results of these cases are the subject of the present report. Malignant and benign cold nodules presented as both uninodular and multinodular defects on ^{131}I or ^{99m}Tc scans, as shown in Table 1.

TABLE 1. SINGLE AND MULTIPLE NODULES ON THYROID SCAN IN 62 PATIENTS AS CORRELATED WITH PATHOLOGICAL FINDINGS

	Pathological findings	
Scan pattern	Benign	Malignant*
Single nodule	32	12
Multinodular	14	3†

* One undifferentiated carcinoma with little uptake could not be classified scintiphotographically.
† This includes two anaplastic carcinomas and one follicular carcinoma.

TABLE 2. ^{67}Ga-CITRATE UPTAKE IN MALIGNANT THYROID NODULES AS CORRELATED WITH CELL TYPE

	^{67}Ga-scan		
Cell type	Positive	Negative	Total
Follicular adenocarcinoma	2	1	3
Papillary adenocarcinoma	1	4	5
Mixed papillary–follicular	0	2	2
Medullary carcinoma	0	1	1
Undifferentiated carcinoma	0	3	3
Metastasis*	2	0	2
			16

* One Grawitz tumor and one squamous cell carcinoma.

All of the 46 benign lesions had negative ^{67}Ga scans. Five of the 16 malignant lesions (31%) produced a positive ^{67}Ga-citrate scan, as shown in Table

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* Deceased.

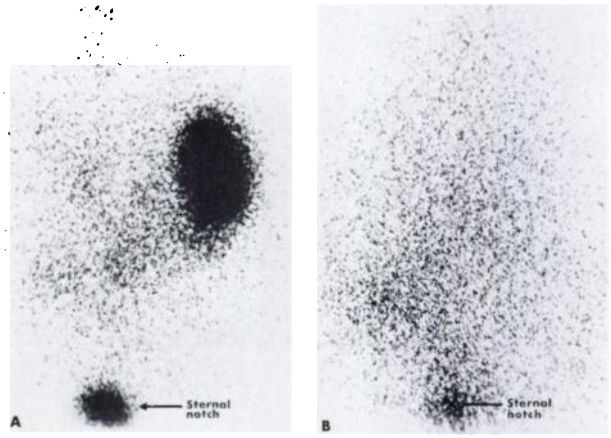

FIG. 1. Patient with multinodular goiter of right lobe. Technetium-99m scan shows cold area in right lobe (A) that accumulates ^{67}Ga-citrate. (B) Pathologic finding: papillary adenocarcinoma.

2. An example of a positive ^{67}Ga scan is shown in Fig. 1.

DISCUSSION

Divergent results have been reported concerning ^{67}Ga uptake in thyroid carcinomas. The small series of Higasi, et al (*3*) did not suggest a good correlation (one of the four thyroid carcinomas being positive). On the other hand Langhammer, et al (*4*) observed gallium uptake in seven of eight patients with thyroid carcinoma, and Roos and van der Schoot (*5*) stated that five of a total of seven patients with thyroid malignancy in clinically multinodular goiters accumulated gallium. Our data agree best with those obtained by Kaplan, et al (*1*) who found three of the seven patients with thyroid carcinoma to have positive gallium scans and those of Erjavec, et al (*6*) who reported four positive ^{67}Ga scans in 13 cases of thyroid carcinoma. The 16 cases we mentioned are, to our knowledge, the largest number yet published.

Kaplan, et al (*1*) reported that none of the three pure differentiated carcinomas showed ^{67}Ga uptake. This seems to confirm the findings of Higasi, et al (*3*) who found no evidence of increased gallium accumulation in three cases of papillary adenocarcinoma, while their case of anaplastic carcinoma was positive. In the recent report of Erjavec, et al (*6*) all four cases of anaplastic carcinoma were positive as against none of the differentiated carcinomas. We noticed, however, that three out of ten adenocarcinomas accumulated ^{67}Ga while none of the three anaplastic carcinomas did. Roos and van der Schoot (*5*) also stated that four of six proven differentiated carcinomas showed a positive ^{67}Ga scan.

The size of the tumor and the presence of necrosis could be important factors. However, in two of our negative observations in anaplastic carcinomas, the pathologist specified that the lesion was over 2 cm in diameter and no necrotic tissue was seen in the specimens. It seems probable, therefore, that other as yet unknown factors are involved. We did not encounter any case of subacute or chronic thyroiditis in this study. This has been mentioned as a possible source of a positive ^{67}Ga-citrate scan (*5,6*).

We conclude from these data that a positive ^{67}Ga scan is strong evidence for malignancy (no false positives being noted in the study) but that the sensitivity of this technique is too low for routine screening in the evaluation of malignancy in cold thyroid nodules.

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