

THYROID CARCINOMA PRESENTING AS A PERTECHNETATE "HOT" NODULE, BUT WITHOUT ^{131}I UPTAKE: CASE REPORT

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A 24-year-old woman presented with a mass on the right side of the neck; this proved to be a hyperfunctioning or "hot" nodule on pertechnetate scan. Because of the firmness of the area, the study was repeated with ^{131}I , but the region did not accumulate radioiodide. The tissue showing this discrepant handling of pertechnetate and radioiodide was surgically removed and identified as a follicular carcinoma with papillary foci. A brief review of the literature data on the disassociation of thyroid trapping and organification functions, and hence of possible discrepancies between pertechnetate and radioiodide uptake, is given.

Pertechnetate ($^{99\text{m}}\text{TcO}_4$) has been widely employed for thyroid imaging, and the kinetics of its uptake (but lack of significant organification) has been documented (1). While pertechnetate and radioiodide usually give similar results in terms of identifying thyroid nodules as functional or non-functional (hot or cold), occasionally differences have been noted. For example, Usher and Arzoumanian (2) reported a case of a trabecular adenoma which showed pertechnetate concentration 30 min after injection, but which did not reveal radioiodide concentration at 24 hr after ^{131}I administration. We wish to report an extreme example of this phenomenon. A thyroid nodule which appeared to be hyperfunctioning on pertechnetate scan did not accumulate radioiodide; at operation it proved to be a follicular carcinoma with some papillary foci.

CASE REPORT

A 24-year-old woman was examined for routine pre-employment evaluation and was found to have a lump in the right side of her neck. She remembered having had a thyroid problem in grade school but did not recall any details. She was found to have a lemon-sized mass, with an enlarged isthmus, in the

right lobe of her thyroid. The patient has two children, in good health. She had had no previous radiation therapy for thymus enlargement, adenoid tissue, acne, cervical nodes, or other reasons. Except for the neck mass, the review of systems proved to be unremarkable.

A thyroid scintiscan, 30 min after intravenous injection of 3 mCi of $^{99\text{m}}\text{Tc}$ -pertechnetate, showed intense uptake in the palpable area. Because of the firmness of the mass, the scan was repeated after oral ingestion of 50 μCi of ^{131}I -sodium iodide. Thyroidal radioiodide uptake was 28% at 24 hr. The scan at 24 hr revealed little, if any activity in the mass (Fig. 1). The right thyroid lobe was removed at surgery; it proved to be an oxyphilic follicular carcinoma with invasion through the capsule. Colloid formation was variable. Clear cell and papillary foci were seen.

DISCUSSION

Discrepancies between "immediate" pertechnetate accumulation and radioiodide incorporation have been reported [for example, the previously mentioned case of Usher and Arzoumanian (2)]. The

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FIG. 1. Anterior $^{99\text{m}}\text{Tc}$ -pertechnetate scintiscan of neck (left) compared with radioiodide rectilinear scan (right).

case presented here represents an extreme example, with pertechnetate uptake of such magnitude as to suggest a hyperfunctioning nodule but insufficient radioiodide concentration even to define the nodule. The significance of this finding can be understood by viewing the several steps of thyroid metabolism: trapping, organification, storage, and release. Pertechnetate uptake represents only the first of these functions. Hence, any intrathyroidal tissue which still possesses the transport or trapping mechanism, even in the absence of all the later steps, will appear functional in the pertechnetate scan.

How often are there disorders which show this trapping process but not organification (in other words, a discrepant handling of pertechnetate and radioiodide)? We can find three reports in the literature, providing a sufficient number of cases to compute the incidence of this finding. As Table 1 shows, the three series are remarkably similar, each reporting an incidence of about one patient in 30 with pertechnetate uptake, but without radioiodide uptake in a thyroid lesion.

What is the pathophysiology of the process? In the study by Shambaugh, et al (3) the patients had any one of three different histologic lesions: adenomatous goiter, follicular adenoma, or thyroid carcinoma. The case reported by Usher and Arzoumanian (2) had an adenoma, while the one reported here had a thyroid carcinoma. We can hypothesize that the transport process, probably located at the periphery of the cells, is still intact, while the organification mechanism has been damaged. Without the organification process, the lesions would probably be deficient in iodine. On the other hand, thyroiditis, with its changing spectrum of findings, has not been clearly noted to have markedly discrepant handling of radioiodide and pertechnetate.

What of the diametrically opposed situation, namely, uptake of radioiodide by a thyroid nodule which did not accumulate pertechnetate? Atkins, et al (4) have alluded to such a finding, but their data are not yet definitive. In terms of our present understanding of thyroid function, nodules with a rapid pertechnetate accumulation, but without iodide incorporation might be expected to occur more fre-

TABLE 1. INCIDENCE OF DISCREPANT HANDLING OF PERTECHNETATE AND RADIOIODIDE

Report	Number of cases studied	Number with discrepant findings
Strauss, et al (6)	56	2
Atkins, et al (7)	100	3
Shambaugh, et al (3)	204	7
Total	360	12

quently than the reverse situation. Indeed, dos Remedios, et al (5) have suggested that radioiodide "... be used to evaluate all ^{99m}Tc 'hot' nodules. ...". It is important to be aware that lesions exist which show discrepant behavior between pertechnetate and radioiodide.

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