

**FIGURE 6.** Scan of the excisional biopsy specimen from Patient 1 demonstrates an intense focal area of  $^{99m}\text{Tc}$ -sestamibi uptake (arrow). Histopathology revealed a 0.7-cm infiltrating ductal carcinoma with microscopically negative margins. This image confirms the accurate localization and resection of the region of abnormal breast uptake.

It is possible that the biologic characteristics of  $^{99m}\text{Tc}$ -sestamibi will localize a focus of breast carcinoma before anatomical changes that are evident on a mammogram. The patients reported here demonstrate that abnormalities not seen on mammograms can be visualized by scintimammography with  $^{99m}\text{Tc}$ -sestamibi. The advantage of nuclear medicine-guided stereotactic prebiopsy localization is to locate and biopsy suspicious lesions seen on scintimammograms when mammography fails to define abnormalities.

The disadvantages of this approach include cost, patient discomfort, radiation exposure and false-positive scintimammograms that would result in "unnecessary" biopsies. This was observed in Patient 3 in this study because of her huge breasts. Mammography and breast physical examination were extremely difficult due to breast size. Each breast required 18 mammographic films to obtain a mammogram. The uncertainty of complete imaging of the breasts as well as the patient's anxiety because a sister had breast cancer prompted the referring physician to request scintimammography before breast reduction surgery. In spite of the increased focal uptake noted on the scintimammogram, the histopathologic diagnosis was proliferative fibrocystic disease. Therefore, biopsy can be considered to be unnecessary.

Future experience with this technique in a larger cohort is necessary to define its clinical utility. Postbiopsy specimen scintigraphy should be a routine part of scintigraphy-guided biopsy, as is specimen radiography after prebiopsy needle localization of an abnormal, nonpalpable mammographically detected lesions. This image will confirm removal of suspicious areas of increased uptake seen on the scintimammogram. In all three patients, focal increased uptake was noted on the postbiopsy specimen scintigram. Since there is minimal photon attenuation seen on the specimen scintigram as well as increased proximity of the lesion to the nuclear medicine detector, we observed significant improvement in the target-to-background counting rate.

## CONCLUSION

Our initial experience demonstrated that nuclear medicine-guided stereotactic prebiopsy needle localization is feasible. Further experience with this technology will enable us to biopsy breast cancer before clinical and mammographic findings, thereby further reducing mortality from this disease.

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# Frontal Sinus Mucocele Mimicking a Metastasis of Papillary Thyroid Carcinoma

Peter Matheja, Hartmut Lerch, Kurt Werner Schmid, Torsten Kuwert and Otmar Schober

Clinic of Nuclear Medicine and Institute of Pathology, University Hospital of Westfälische Wilhelms-University of Münster, Germany

Radioiodine scans are highly specific for detecting metastases of well-differentiated thyroid carcinomas. However, false-positive  $^{131}\text{I}$  whole-body scans may occur as illustrated in the following case report. In a 53-yr-old patient, abnormal  $^{131}\text{I}$  uptake was found in the right frontal skull 4 wk after total thyroidectomy and radioiodine therapy for papillary thyroid cancer. Bone scans and planar x-rays of the skull were unremarkable, and the serum thyroglobulin level was

within normal limits. X-ray CT revealed a small nodule in the right frontal sinus corresponding to the pathological focus of  $^{131}\text{I}$  uptake. Surgical removal and histopathological examination of this lesion yielded a mucocele, a slow-growing lesion of the paranasal sinuses accumulating mucous material. The postoperative  $^{131}\text{I}$  scan was unremarkable. The possibility of a false-positive finding on radioiodine scans should be considered, particularly when the serum thyroglobulin level is not elevated.

**Key Words:** thyroid carcinoma; iodine-131; mucocele

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For correspondence or reprints contact: Peter Matheja, MD, Clinic of Nuclear Medicine, University of Münster, Albert-Schweitzer-Str. 33, 48129 Münster, Germany.

Scans performed in hypothyreosis after oral ingestion of  $^{131}\text{I}$  are a routine procedure in the follow-up of patients with well-differentiated papillary or follicular thyroid cancer (1). Since this procedure is specific in 96% of cases, false-positive  $^{131}\text{I}$  concentrations in noncancerous thyroid tissue are rare (2). However, failure to identify these rare instances could lead to an erroneous diagnosis of metastases and inefficacious and inappropriate therapeutic interventions such as administration of high doses of radioiodine. Here we report a marked concentration of  $^{131}\text{I}$  in a mucocele mimicking a metastasis of papillary thyroid carcinoma in a 53-yr-old woman.

## CASE REPORT

A 53-yr-old woman was diagnosed with papillary thyroid carcinoma pT<sub>2</sub> pN<sub>0</sub> M<sub>x</sub> in the right lower lobe of the thyroid gland at the time of total thyroidectomy. The patient received an algorithm of further therapy and follow-up (3). Four weeks after thyroidectomy, the patient was given 3 GBq  $^{131}\text{I}$  by mouth to achieve ablation of residual thyroid tissue that was visible on the first postoperative radioiodine scan. In addition to physiological  $^{131}\text{I}$  uptake in gastric and nasal mucosas, the liver and the bladder, a focus of marked accumulation of  $^{131}\text{I}$  was found in the right frontal region of the skull.

This accumulation persisted despite intensive washing of the skin. At this time, serum thyroglobulin was below 1 ng/ml; serum antibodies against thyroglobulin were not detected. X-ray of the skull was inconclusive due to asymmetrical frontal sinuses. Bone scanning with  $^{99\text{m}}\text{Tc}$ -methylene diphosphonate (MDP) disclosed no pathological lesions.

Although  $^{131}\text{I}$  uptake in the residual thyroid tissue had markedly decreased 3 mo later, the  $^{131}\text{I}$  uptake in the right frontal region of



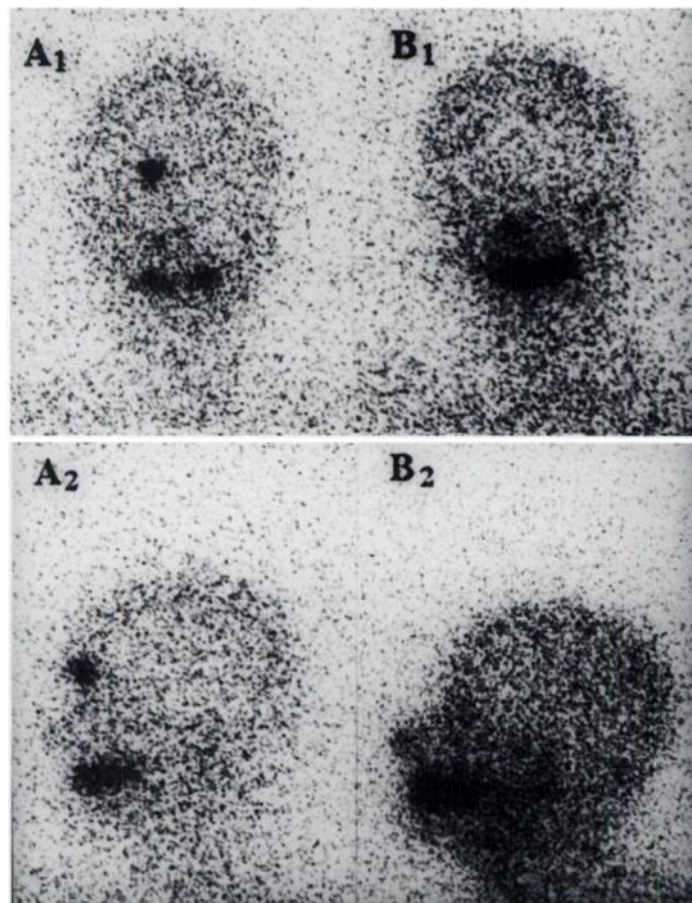
**FIGURE 2.** CT of the skull reveals a small nodule at the bottom of the right frontal sinus.

the skull was unchanged (Fig. 1). An x-ray of the skull and the serum thyroglobulin level were unremarkable. X-ray cranial CT revealed a nodular thickening of the mucous membrane of the right frontal sinus. The osseous structures were unaffected (Fig. 2).

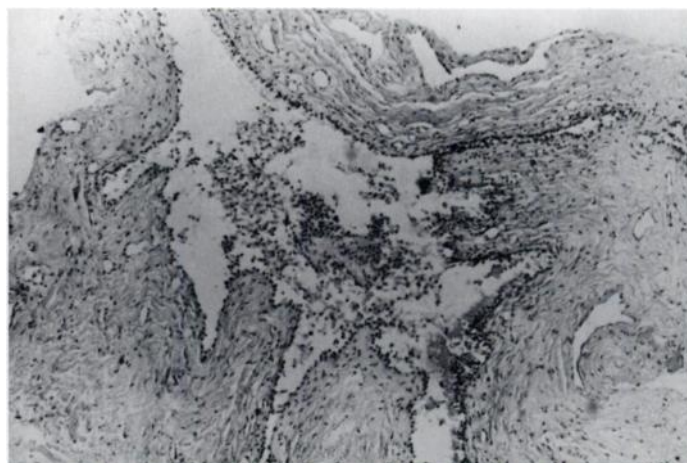
Surgical removal of the lesion yielded a mucocele filled with yellow fluid. Histological examination disclosed fibrous tissue lined by ciliated pseudostratified cuboidal epithelium with a few goblet cells typical of a mucocele of a paranasal sinus (Fig. 3). Metastatic deposits of the thyroid papillary carcinoma could not be detected in the resected specimen. Six weeks after surgery, the  $^{131}\text{I}$  scans were completely normal (Fig. 1).

## DISCUSSION

Pathological foci of  $^{131}\text{I}$  accumulation mimicking metastases of well-differentiated thyroid carcinomas are rare; most of the cases described in the literature represent nonspecific uptake by inflammatory processes, such as sinusitis, or by tumors, such as meningiomas, gastric carcinomas or bronchogenic carcinomas



**FIGURE 1.** Iodine-131 scans (500 MBq): (A<sub>1</sub>) frontal and (A<sub>2</sub>) left lateral scans before surgery with focal radiiodine accumulation in the right skull; (B<sub>1</sub>) frontal and (B<sub>2</sub>) left lateral normal scans after extirpation of the mucocele.



**FIGURE 3.** Histology: mucocele of the paranasal sinus (hematoxylin and eosin, 40x).



(4–10). Furthermore, false-positive findings may be produced by malformations or dystopia of the organs that excrete iodine, such as by intestinal diverticula or an ectopic kidney (5,10–15). Very rarely, struma ovarii may be the cause of the pathological  $^{131}\text{I}$  accumulation (16). Veronikis et al. described nonmetastatic thymic uptake of  $^{131}\text{I}$  in patients with benign diseases of the thyroid gland (17).

In our patient, the right frontal focus of  $^{131}\text{I}$  accumulation corresponded to a mucocoele of the right frontal sinus. This was proven by the absence of a metastasis of the thyroid cancer in the resected specimen and the disappearance of the right frontal  $^{131}\text{I}$  accumulation after surgery. Mucocoeles are slow-growing, benign lesions localized in the paranasal sinuses and lined by respiratory epithelium (18). Consequently, the marked accumulation of radioiodine observed in our patient may have been caused by secretion and subsequent sequestration of mucous material within that benign neoplasm.

The possibility of a false-positive  $^{131}\text{I}$  scan should be kept in mind when treating patients with thyroid cancers. This applies, in particular, to patients with pathological extrathyroidal  $^{131}\text{I}$  uptake but normal serum thyroglobulin levels.

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# Acute Liver Necrosis Induced by Iodine-131-MIBG in the Treatment of Metastatic Carcinoid Tumors

Vivian Bongers, John M.H. de Klerk, Bernard A. Zonnenberg, Gerard de Kort, Cees J.M. Lips and Peter P. van Rijk  
Departments of Nuclear Medicine, Internal Medicine and Radiology, University Hospital Utrecht, Utrecht, The Netherlands

Iodine-131-metaiodobenzylguanidine (MIBG) is used in the treatment of carcinoid tumors. Temporary palliation with complete subjective symptomatic response has been reported in these patients. This treatment is usually well tolerated and side-effects are generally limited to nausea, mild hepatic toxicity with spontaneous recovery and temporary myelosuppression. Our case report shows that repeated treatment with  $^{131}\text{I}$ MIBG in a patient with extensive carcinoid liver metastasis may cause severe hepatic toxicity leading to death. Factors such as concomitant use of 5-fluorouracil and the progressive nature of the disease may have contributed to this event.

**Key Words:** iodine-131-MIBG; carcinoid tumor; acute liver necrosis; therapy

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**C**arcinoid tumors are slow-growing neoplasms arising from the amine precursor uptake and decarboxylation cells of the diffuse endocrine system. The use of  $^{131}\text{I}$ metaiodobenzylguanidine (MIBG) in neural crest and other potentially  $^{131}\text{I}$ MIBG-concentrating tumors for both diagnostic and ther-

apeutic purposes has been developed after successful application of  $^{131}\text{I}$ MIBG in the localization of pheochromocytoma (1). In contrast to neuroblastoma and pheochromocytoma, the role of  $^{131}\text{I}$ MIBG in the treatment of metastatic carcinoids is mainly palliative. The cumulative results of  $^{131}\text{I}$ MIBG treatment in metastatic carcinoid tumors indicate a palliative effect in 65% and tumor reduction in 15% (2–6). To date, reported toxicity has been limited to nausea and vomiting and transient myelosuppression. Besides these effects, transient mild hepatic dysfunction 1 wk after treatment with full recovery after conservative therapy has been reported in one of four patients with liver metastases due to a carcinoid tumor (7). We treated 12 patients with  $^{131}\text{I}$ MIBG (1 with pheochromocytoma, 2 with medullary thyroid carcinoma and 9 with carcinoid tumors) at our hospital. The present case demonstrates an unexpected, severe complication of  $^{131}\text{I}$ MIBG therapy for carcinoid with widespread liver metastasis.

## CASE REPORT

Two years before a liver metastasis appeared, our patient underwent a radical pancreaticoduodenectomy for a primary pancreatic carcinoid. The initial diagnosis was made when he presented with attacks of flushing and diarrhea. At that time, no distant metastasis was known, especially no liver metastasis. Shortly

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For correspondence or reprints contact: Vivian Bongers, MD, PhD, University Hospital Utrecht, P.O. Box 85500, 3508 GA Utrecht, The Netherlands.