Breast Cyst Simulating Metastases on Iodine-131 Imaging in Thyroid Carcinoma

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False-positive radioiodine uptake has been reported in many organ systems. We describe a female patient who had mixed papillary and follicular thyroid carcinoma, and on radioiodine total-body imaging demonstrated focal, lower-right chest uptake. Special prone imaging with the right breast dependent proved that the uptake was inside the right breast. Review of a recent breast ultrasound and mammograms showed this uptake to correspond to a large breast cyst. It is known that ¹³¹I breast uptake may be functional within the mammary gland. In this patient, it was due to retention within the cyst after the background activity decreased. Knowledge of this phenomenon may improve the interpretation of total-body ¹³¹INa studies.

Key Words: iodine-131; radioiodine imaging; breast cyst; thyroid carcinoma

J Nucl Med 1998; 39:1910-1912

CASE REPORT

A 48-yr-old woman with a history of (mixed papillary and follicular) thyroid carcinoma status postsubtotal thyroidectomy and 150 mCi ablative/therapeutic radioactive iodine therapy 6 mo previously was presented. Routine follow-up and whole-body radioactive iodine imaging after a 6-wk thyroxine withdrawal was done. The patient was neither pregnant nor lactating. Scintigraphy at 48 hr after 10 mCi oral ¹³¹INa revealed a partial resolution of the previously described post-therapy neck radioactive iodine uptake. However, a new focus of increased radioactive iodine activity was present in the lower-right chest (Fig. 1A, curved arrow). A lateral view demonstrated that the abnormal focus was anterior, at about

Received Dec. 19, 1997; revision accepted Feb. 18, 1998.

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the chest wall (Fig. 1B, curved arrow). This raised the possibility of the focus being localized in the breast of this patient. For more precise localization of the focus, with the patient prone and the breast suspended, a right-lateral image was obtained, using parallel-hole, high-energy collimation (Fig. 1C). This confirmed that the focus of radioactive iodine was within her right breast.

A detailed history, clinical examination and review of previously performed mammograms and ultrasonograms of the breasts revealed the following: 6 mo ago, on a routine screening mammogram, a large, circumscribed density was noted located in the lateral aspect of the right breast (Fig. 2A, arrows). The patient was then recalled for further evaluation of the breast with ultrasound. A large, nontender, simple cyst showing an anechoic lumen, posterior wall enhancement and enhanced through transmission was demonstrated in the right breast corresponding to the density of the mammograms (Fig. 2B, arrows). There was no evidence of intracystic tumor, and these findings were consistent with a benign lesion. The patient was reassured that her findings were benign and was instructed to practice breast self-examination and have annual screening mammograms.

The exact localization of the radioactive iodine focus in the right breast and the realization that it was corresponding to the cyst diagnosed by mammography and ultrasonography was reassuring as a benign cause for the current radioactive iodine finding. It was concluded that the accumulation of radioactive iodine in the breast is similar to ¹³¹I retention seen by renal and other cysts (1,2,3). The patient was reassured about the benign nature of the breast finding and thyroxine suppression treatment was re-established. The patient will be followed by her primary endocrine physician. For residual neck uptake, follow-up thyroglobulin levels and reevaluation in 6–12 mo was advised.



FIGURE 1. (A) Anterior chest view with patient supine 48 hr after 10 mCi ¹³¹INa (parallel-hole, high-energy collimation). Stemal notch is marked (hollow arrow). Notice residual neck activity and a focus in right lower chest (curved arrow). (B) Right lateral decubitus view. Stemal notch is marked (hollow arrow). Notice that abnormal focus (curved arrow) is located anteriorly (chest wall or breast) and that it has moved cephalad. This was explained as a result of upward movement of breast, when patient was placed in right lateral decubitus position. (C) Right lateral view with patient prone and breast suspended. Outline of breast was marked by placement of linear marker. Lesion is visualized in posterior aspect of breast (curved arrow). Hollow arrow indicates stemal notch.

Fluids	Gastrointestinal	Breast	Thyroid	Cung	Cardiac	Thymus	Kidneys	Skin
Contarnination Saliva Saliva Sweat Sputurn/respiratory secretions (tracheostomy) Breast milk Vomit	Esophageal stricture/dysmotility → achalasia, Barrett's esophagus Hiatal hemia Gastric pull-up Zenkers diverticulum Colonic bypass graft of esophagus Gastro-esophageal reflux Poorly dissolved capsule Cholecystitis Bowel content	Lactating breast Nonlactating breast Breast cyst	Ectopic thyroid tissue Thoracic Paracardiac (struma cordis)	Inflammatory disease Fungus Lung cancer Bronchitis	Normal cardiac blood-pool displaced by pectus excavatus Pericardial inflammation Pericardial effusion Pleuropericardial cyst	Parenchymal uptake	Renal cysts Obstruction	Sebaceous cyst

False-Positive Causes of Radioiodine

DISCUSSION

There are many known causes for false-positive foci on ¹³¹I total-body scans. Table 1 lists previously documented falsepositive causes of radioiodine in the chest (4-41). Frequent or rare benign uptake can occur in most organ systems, including the head and neck, cardiovascular, pulmonary, gastrointestinal, genitourinary, reproductive and dermatological (42). Uptake in the breast and within the mammary gland has been described in both lactating and nonlactating women (43,44,45). In many cases, this uptake (focal or nonfocal) can be misinterpreted as either diffuse lung uptake secondary to metastatic disease or to a focal metastatic deposit within the lungs or ribs (43,44). The mechanism of mammary gland breast uptake still remains unclear, but the excretion in breast milk has been demonstrated numerous times (46,47,48). It is, therefore, believed that it is due to active uptake by the mammary glands.

The special lateral imaging with the breast suspended revealed in this patient localized, unequivocally, the radioactive iodine focal accumulation observed on the planar images within the breast. When scintigraphy was correlated with mammographic and sonographic scans, it was found that the radioactive iodine uptake was indeed within a breast cyst. Radioactive iodine accumulation has been shown in cysts of other organs (2,3,49-51). Such accumulation has been attributed to the slow exchange of water and chemical elements between the cysts and their surrounding extracellular/extravascular environment. While high iodine levels are present in their environment (extracellular, extravascular space) soon after the administration of NaI, a small amount is diffused (either passively or even actively by the lining of the cyst cells) and trapped inside the cysts; there, NaI stays longer (slow exchange) than in extracellular space, which is rapidly cleared due to effective urinary excretion of iodine. At a certain time, there is a higher concentration of activity in the cysts than in their background, and a focus of relatively increased activity may be observed by imaging (52). The mechanism may be one of a totally passive kinetic phenomenon or it may be due partially to active uptake (52). The same mechanism can explain the visualization of the breast cyst in this patient. Breast cysts appear and are spontaneously resolved with variable residence. This may explain why, in this patient, a previous radioactive iodine scan showed no uptake in her right breast.

CONCLUSION

It is important to consider focal retention by cysts in the breasts as the potential cause of lower, anterior chest activity on a total-body radioactive iodine scintiscan in women. A lateral view, with the breast suspended as above, can specify the exact location. Mammography and sonography is then necessary to define the nature of the lesion.

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