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Accumulation of Tc-99m MIBI in breast lymphoma: Comparison with Ga-67 citrate

Yoshihiro NISHIYAMA, Yuka YAMAMOTO, Yukiko KAWASAKI, Katashi SATOH, Hitoshi TAKASHIMA, Motoomi OHKAWA and Masatada TANABE

Department of Radiology, Kagawa Medical School

We report 2 cases of malignant lymphoma of the breast which were clearly shown on total body imaging as well as on SPECT with Ga-67 and Tc-99m MIBI. Tumor accumulation of Ga-67 was seen in all cases including a recurrent tumor. Ga-67 scintigraphy is useful for follow up in detecting relapse, as well as in predicting responses to therapy. Tc-99m MIBI was found to accumulate in the malignant lymphoma of the breast, and especially SPECT images of breast lesions provided better contrast than planar images, and Tc-99m MIBI SPECT could diagnose localization of the tumor because there was no uptake by the breast. But the Tc-99m MIBI accumulation of the tumor was lower than Ga-67.

Key words: Ga-67 scintigraphy, Tc-99m MIBI scintigraphy, SPECT, breast lymphoma

INTRODUCTION

PRIMARY LYMPHOMA of the breast is rare, accounting for only 0.5% of all malignant breast tumors and 0.4% of all non-Hodgkin's lymphomas (NHL).[1–4] Ga-67 has been shown to be an effective radiopharmaceutical in the detection of many types of malignancies. In particular it is also a valuable adjunct in the diagnosis of malignant lymphomas.[5] On the other hand, Hexakis(2-methoxy-isobutyl isonitrile)technetium (Tc-99m MIBI) is a new tracer of myocardial blood flow. It also accumulates in a broad range of organs, including the thyroid, breast and lungs. The accumulation of Tc-99m MIBI was evaluated in malignant lesions of these organs.[6–8] We present two patients in whom breast lymphoma was demonstrated on total body imaging as well as on SPECT with Ga-67 and Tc-99m MIBI.

CASE REPORT

Patient One

A 47-year-old woman with a history of urinary bladder removal and hysterectomy because of urinary bladder carcinoma. At the time of surgery, she was also diagnosed as having malignant lymphoma of the vaginal stump. Shortly after the surgery, she presented with a left breast mass (Fig. 1-A). Ga-67 scintigraphy showed intense activity in the left breast mass (Fig. 1-B). Lumpectomy was performed and histopathology revealed NHL of the breast. Following combination chemotherapy, Ga-67 scintigraphy revealed no abnormality with complete remission. The patient noticed the tumor after one year. Ga-67 scintigraphy showed abnormal accumulation in the left breast tumor, strongly suggesting recurrent malignant lymphoma. Biopsy of this tumor confirmed positive recurrence of malignant lymphoma. At the same time, Tc-99m MIBI scintigraphy was performed. In the planar image, mildly increased accumulation was present. In the SPECT image, Ga-67 studies demonstrated abnormal accumulation by the left mass, but the extent of the breast tumor could not be accurately assessed on Ga-67 imaging because of the physiological uptake of Ga-67 in the normal breast. In the SPECT image of Tc-99m MIBI, an abnormal breast mass activity was evident, and no accumulation was present in the normal breast (Fig. 1-C).

Patient Two

A 57-year-old woman with swelling of both breasts (Fig. 2-A, B). Breast mass biopsy suspected malignant lymphoma which was confirmed on surgery. Ga-67 scintigraphy before surgery showed noticeably increased

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For reprint contact: Yoshihiro Nishiyama, M.D., Department of Radiology, Kagawa Medical School, 1750–1 Ikenobe, Miki-cho, Kagawa 761–07, JAPAN.

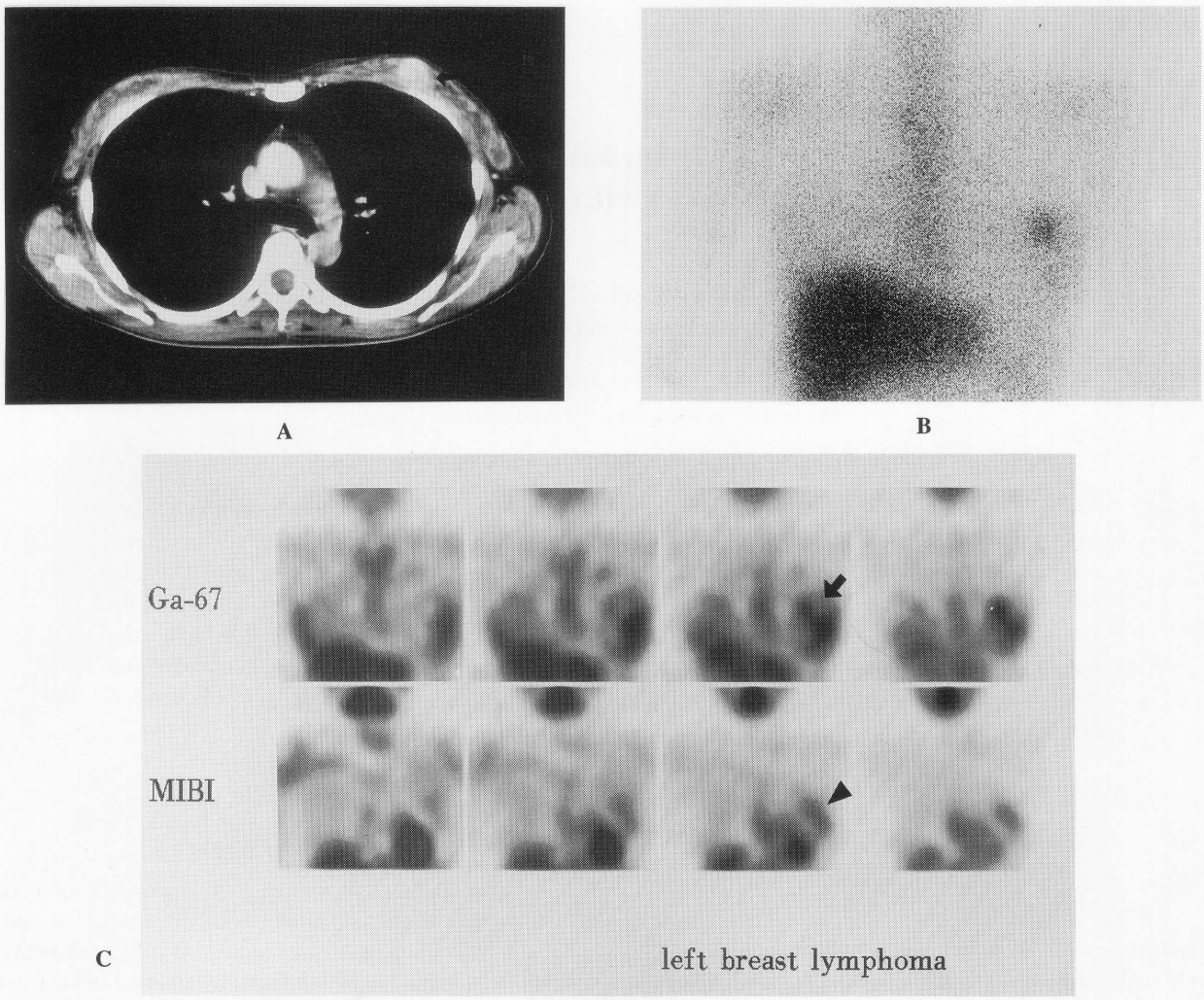

Fig. 1 A) A 47 year old woman with NHL of left breast. Chest CT demonstrates abnormal enhanced mass in the left breast (↑). (April, 1993); B) Ga-67 planar scintigraphy shows intense activity in the left breast mass. (April, 1993); C) SPECT of Ga-67 (↑) (upper) and Tc-99m MIBI (▲) (lower) shows intense activity in the left recurrent breast mass, but both images are not similar. In the SPECT image of Tc-99m MIBI, abnormal breast mass activity is evident, and no uptake is present in the normal breast. In the SPECT image of Ga-67, the extent of the tumor can not be accurately assessed because of the physiological uptake accumulation in the normal breast. (May, 1994)

accumulation in both breasts. On the other hand, the planar image of Tc-99m MIBI showed a minimal increased activity in both breasts. Ga-67 SPECT image showed noticeably increased accumulation in both breasts. Tc-99m MIBI SPECT image showed minimal increased accumulation in both breasts compared to Ga-67 SPECT, but the diagnosis in the right breast was difficult probably due to the high levels of activity in the chest wall (Fig. 2-C).

DISCUSSION

Breast carcinoma is reported to have Ga-67 accumulation in 65–70% of cases.[9] Malignant lymphoma of the breast also has been reported to take up Ga-67.[10–12] The accumulation of Ga-67 is known to be more than 70% in malignant lymphomas of all organs. In our study, Ga-67 images showed noticeably increased accumulation including the recurrent tumor. Ga-67 is therefore useful for diagnosing malignant lymphoma of the breast and for follow up evaluation after treatment.

Tc-99m MIBI is a new tracer of myocardial blood flow.[13] It also accumulates in thyroid cancer, parathyroid adenoma, breast cancer and lung cancer and is suggested to be a potential tumor imaging agent,[6–8] but to our knowledge, the accumulation of Tc-99m MIBI in malignant lymphoma of the breast has not been reported. The exact mechanism of action of Tc-99m MIBI in the tumor is unclear. Our results have shown that Tc-99m MIBI planar and SPECT imaging were positive in all lesions, but the right breast tumor with Tc-99m MIBI in Patient Two showed minimal accumulation in the planar and SPECT

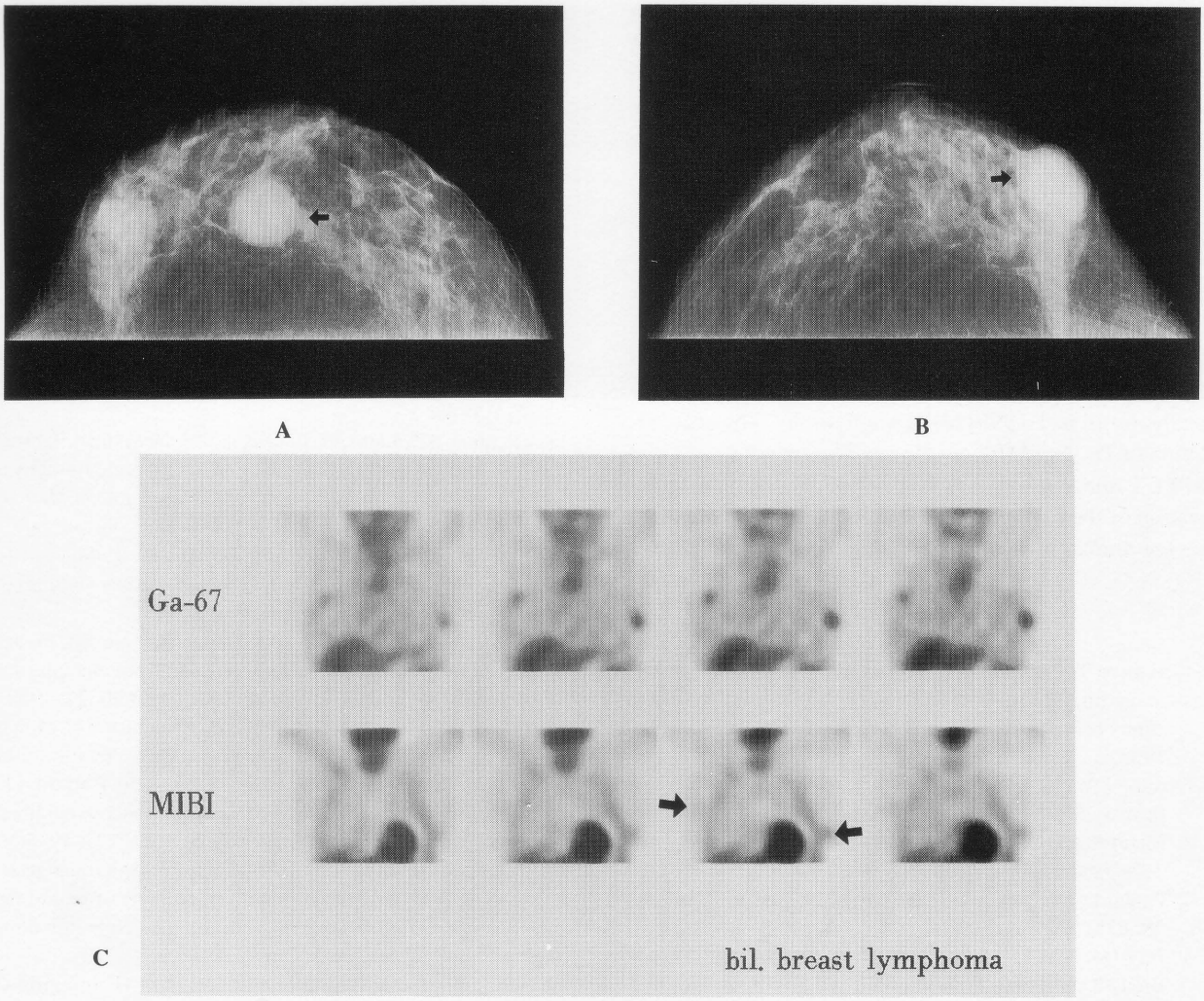

Fig. 2 A) A 57 year old woman with NHL of both breasts. Craniocaudal mammogram of the right breast demonstrates well-defined mass (↑). (March, 1994); B) Craniocaudal mammogram of the left breast demonstrates well-defined mass as well as right breast mass (↑). (March, 1994); C) SPECT of Ga-67 (upper) shows markedly increased uptake in both breasts. SPECT of Tc-99m MIBI (lower) image shows a minimal increased accumulation in the both breast (↑). And in the right breast, the location of the tumor is complicated by the high levels of activity present in the chest wall. (March, 1994)

images. Physiological activity of Tc-99m MIBI appears in the myocardium, biliary system and digestive tract. When we performed Tc-99m MIBI scintigraphy in 49 lung cancer patients, noticeable accumulation by the chest wall was observed in 12 patients (unpublished data). In the present study, the chest wall showed high accumulation in Patient Two, which might have interfered with the lesion.

The degree of accumulation of Tc-99m MIBI was lower than that of Ga-67. A difference between Ga-67 and Tc-99m MIBI was observed in accumulation patterns. Patient One showed that the extent of the breast tumor could not be accurately assessed on Ga-67 imaging because of the physiological uptake by the normal breast, but SPECT imaging of Tc-99m MIBI could diagnose localization of the tumor because there was no uptake by the normal breast. The Tc-99m MIBI image has a distinct advantage in that patients can be imaged immediately after the injection, and it is also possible to inject a higher dose of Tc-99m MIBI and better images can be obtained. On the other hand, the Ga-67 image is generally obtained 48 hours after an intravenous injection.

Because the degree of accumulation of Tc-99m MIBI was lower than that of Ga-67, Tc-99m MIBI is inferior to Ga-67 in breast lymphoma tumor detection. But there is the report showing that a correlation between the accumulation of Tc-99m MIBI, the effect of chemotherapy[14] and the data of Piwnica-Worms et al. indicate that Tc-99m MIBI is recognized as a substrate by P-glycoprotein.[15] Tc-99m MIBI scintigraphy illustrates the potential application of this transport substrate in functional imaging. Indeed, in Patient One, the chemotherapy was performed after Tc-99m MIBI scintigraphy and the tumor was reduced. In our study, only one case showed a correlation

between the chemotherapy and Tc-99m MIBI. While myocardial uptake of Tc-99m MIBI is constant over 1 hour, tumor uptake increases initially and then decreases with time.[16] Further studies are required to define the role of Tc-99m MIBI in lymphoma of the breast including the acquisition time.

CONCLUSION

Ga-67 scintigraphy showed strong accumulation in malignant lymphoma of the breast and recurrent tumor. Tc-99m MIBI was found to accumulate in malignant lymphoma of the breast, and SPECT imaging was especially useful in Tc-99m MIBI scintigraphy. The accumulation of Tc-99m MIBI was lower than that of Ga-67, but SPECT imaging of Tc-99m MIBI could diagnose localization of the tumor because of the lack of accumulation by the normal breast.

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