

^{99m}Tc-MIBI

Technetium-99m methoxyisobutylisonitrile(^{99m}Tc-MIBI)

: 1997 1 1998 10 64
, ^{99m}Tc-MIBI

: 64 33 가 31 가
86.2%, 64.5%, 가 87.9%, 76.7%, ^{99m}Tc-MIBI
78.8%, 74.2%

: ^{99m}Tc-MIBI 가
(biopsy)

3 가
50 가
30% (1, 2). 가
가 70-90%가 가
가 가 가
50 가
가 (3-7). Technetium-99m
methoxyisobutylisonitrile(MIBI)

(8). (Fat necrosis), (Hemato-
(Fibrosis), (Abscess) (Scarring) ^{99m}Tc-MIBI

가

(9, 10). 1997 1 1998 10 가
가 61 25
87 44.4
^{99m}Tc-MIBI 56 , 60

¹가
²가
³가

1999 6 16 1999 11 9

dices)

(Receiver operating characteristic curve)
 (1.98) 1.98 , 1.98
 (Fig. 1, 2).

61 64 가 21
 (excisional biopsy) 33
 (US (guided automated gun biopsy)
 7
 . 3
 가
 33 33
 (Invasive ductal carcinoma) 26 ,
 (Mucinous carcinoma) 2 ,
 (Malignant phyllodes tumor) 2 , (Intraductal
 carcinoma) (Tubular carcinoma) 1 ,
 (Intraductal papilloma)
 1 , (Invasive lobular
 carcinoma) 가 1 3
 가 1cm , 20 가 1-3cm
 10 가 3cm
 28 31 가 3
 가
 (Fibroadenoma) 13 ,
 (Fibrocystic disease) 6 ,
 가 5 , 가 2 , 2 ,
 (Adenosis) 1 , (Proteinaceous materi-
 al) 가 1 , (Ductal and
 acinar proliferative lesion) 1 23
 가 1-3cm 6 가 3cm . 2
 56 59 가
 29 가 , 30 가
 3
 가
 , 23
 4 가 , 11 (Table
 가 가
 4 가 3
 가
 (circumscribed mass)
 ,
 4 2 가
^{99m}Tc-MIBI
 2 , 87.9%, 76.7%
 80.6%, 85.2%,
 23.3%, 12.1%, 82.5%

Table 1. Statistical Results of Mammography, Ultrasonography and ^{99m}Tc-MIBI Scintimammography in the Diagnosis of Breast Lesions

	MM	US	MIBI
TP	25(42.4%)	29(46%)	26(40.7%)
FN	4(6.8%)	4(6.4%)	7(10.9%)
FP	11(18.6%)	7(11.1%)	8(12.5%)
TN	19(32.2%)	23(36.5%)	23(35.9%)
Total	59	63	64

TP: True positive, FN: False negative,
 FP: False positive, TN: True negative
 MM: Mammography, US: Ultrasonography,
 MIBI: ^{99m}Tc-MIBI scintimammography

^{99m}Tc-MIBI
 11 1
 , 2 5
 , 2 , 1 가
 , 4 1
^{99m}Tc-MIBI 4 가
 1 , 1 ,
 2
 86.2% 64.5%
 69.4%, 83.3%,
 35.5%, 13.8%, 75%
 1 60
 63 가 33
 가 , 30 가 . 3
 가
 36 , 27
 4 가 (Table 1).
 4
 가
 가
 , 2 1
^{99m}Tc-MIBI 3
 가
 7 가
 , 1 5
 , 4 , 3
^{99m}Tc-MIBI 2
 , 5
 87.9%, 76.7%
 80.6%, 85.2%,
 23.3%, 12.1%, 82.5%

^{99m}Tc-MIBI
 33 33 가 , 31 가
 . ^{99m}Tc-MIBI 34 , 30
 7 7 가
 (Table 1). ^{99m}Tc-MIBI
 4 가 1-2cm 1
 , 1 , 5
 , 5 2
 , 4 3
 가 (Fig.2-C) 4
 , 4 (Fig.2-A)
 2 , 6 (Fig.2-B)
 1 , 1
 , 3 , 3
 .
^{99m}Tc-MIBI 78.8%, 74.2%
 76.5%, 76.7%,
 25.8%, 21.2%, 76.7% .

: ^{99m}Tc-MIBI
 , , ,
 Table 2
 87.9%, 76.7% 가
 82.5% 가
 80.6%,
 85.2% 가

Table 2. Comparison Between Mammographic, Ultrasonographic and Scintigraphic Results in Breast Lesions

	MM	US	MIBI
Sensitivity (%)	86.2	87.9	78.8
Specificity (%)	64.5	76.7	74.2
PPV (%)	69.4	80.6	76.5
NPV (%)	83.3	85.2	76.7
FPR (%)	35.5	23.3	25.8
FNR (%)	13.8	12.1	21.2
Accuracy (%)	75.0	82.5	76.6

PPV:positive predictive value, NPV:negative predictive value,
 FPR:false positive rate, FNR:false negative rate.
 MM:Mammography, US:Ultrasonography,
 MIBI:^{99m}Tc-MIBI scintimammography

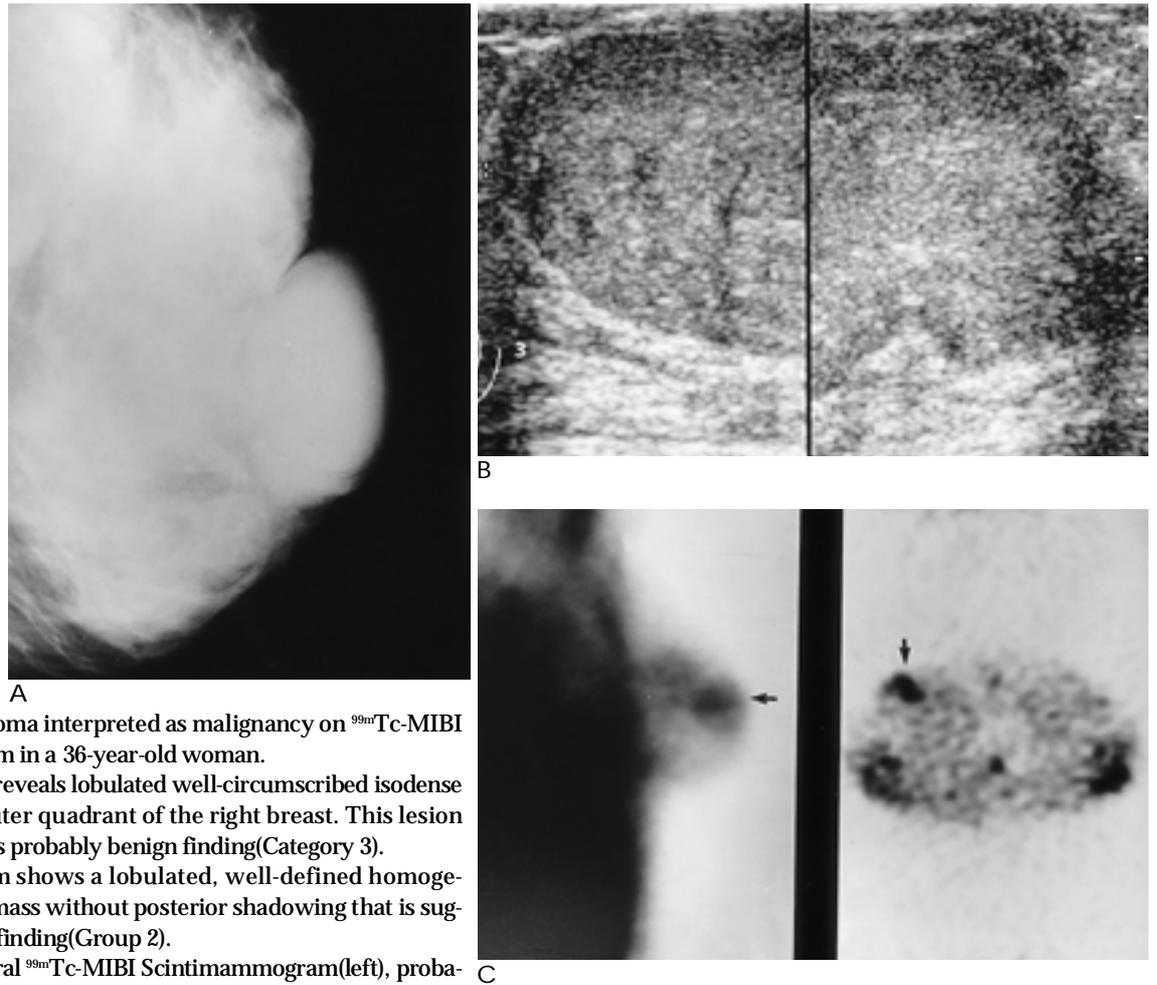


Fig. 2. Fibroadenoma interpreted as malignancy on ^{99m}Tc-MIBI Scintimammogram in a 36-year-old woman.
 A. Mammogram reveals lobulated well-circumscribed isodense mass in upper outer quadrant of the right breast. This lesion was interpreted as probably benign finding(Category 3).
 B. Ultrasonogram shows a lobulated, well-defined homogeneous isoechoic mass without posterior shadowing that is suggestive of benign finding(Group 2).
 C. On planar lateral ^{99m}Tc-MIBI Scintimammogram(left), probably malignant diffuse tracer uptake was noted in the right breast(arrow). Transverse SPECT scan(right) also shows increased tracer uptake in right breast(arrow). The arithmetic mean of the semiquantitative indices was 2.64, suggesting malignancy.

가 23.3%, 12.1% 가 . ^{99m}Tc-MIBI , 가

²⁰¹Thallium, ^{99m}Tc-Methylene Diphosphonate, ^{99m}Tc-pertechnetate, ⁶⁷Gallium-citrate 가 ^{99m}Tc-MIBI

(17). ^{99m}Tc-MIBI 가

(membrane potential) ,
(mitochondria)가

가 (screening) .
가 15% - 75%

(18). ^{99m}Tc-MIBI

(proliferative dysplasia)

가
가
(12).

Palmedo

^{99m}Tc-MIBI

, ,
85%, 66%, 70%, 83%
89%, 14%, 49%, 57%

, Sickles
97%, 58%

(13).

(18).

88%-94%

^{99m}Tc-MIBI

. Ozdemir (20)

가

가 가

, Thallium-201

93%, 95%, 95%

(14).

97%

가

,
58%, 67%, 60%

92%, 50%, 75%

가

63%, 63%, 100%

. Burak (21)

^{99m}Tc-MIBI 93%

86%

ductal echography

가

^{99m}Tc-MIBI

가

BI-RAD™

3

(15). Williams DY (

가

2

3

1

25%

^{99m}Tc-MIBI

78.8%

)

가

^{99m}Tc-MIBI

^{99m}Tc-MIBI

가

^{99m}Tc-MIBI

가

가

(16).

가

^{99m}Tc-MIBI

가

(real-time)

가

가

가

(Silicone)

가

86.2% 87.9%

^{99m}Tc-MIBI

64.5%

76.7%, 74.2%

^{99m}Tc-MIBI

가

^{99m}Tc-MIBI

^{99m}Tc-MIBI

, ^{99m}Tc-MIBI

. ^{99m}Tc-MIBI

1. (1993. 1.1.-1993.12.31). 1995.5.
2. Andersson I. Mammographic screening and mortality from breast cancer:mammographic screening trial. *Br J Med* 1988;297:943-948.
3. Ciatto S, Cataliotti L, Distanti V. Nonpalpable lesions detected with mammography: review of 512 consecutive cases. *Radiology* 1987;165:100-102
4. Hermann G, Janus C, Schwartz IS et al. Nonpalpable breast lesions:accuracy of prebiopsy mammographic diagnosis. *Radiology* 1987;165:323-326
5. Robertson CL. A private breast imaging practice:medical audit of 25,788 screening and 1,077 diagnostic examination. *Radiology* 1993;187:75-79.
6. Kopans DB. Positive predictive value of mammography. *AJR* 1992;158:521-526.
7. Joensuu H, Asola R, Holli K, Kumpulainen E, Nikkanen V, Parvonen LM. Delayed diagnosis and large size of breast cancer after a false negative mammogram. *Eur J Cancer* 1994;30:1299-1302.
8. Kopans DB. What is a useful adjunct to mammography? *Radiology* 1986;161:560-561.
9. Feig SA. Breast masses. Mammographic and sonographic Evaluation. In Bassett LW, editor. *Breast Imaging: Current Status and Future Directions. Radiol Clin of North Am* 1992;30(1):67-92
10. Fornage BD, Lorigan JG, Andry E. Fibroadenoma of breast:sonographic appearance. *Radiology* 1989;172:671-676
11. 1997;36: 909-914
12. Kopans DB. The positive predictive value of mammography. *Radiol Clin North Am* 1992;158:521-526
13. Sickles EA, Filly RA, Callen PW. Breast cancer detection with sonography and mammography;comparison using state-of-the-art equipment. *AJR* 1983;140:843-845
14. Wei Tse Yang, MBBS, FRCR et al. Role of high frequency ultrasonography in the evaluation of palpable breast masses in Chinese women:Alternative to Mammography? *J Ultrasound Med* 1996;15: 637- 644
15. 1995;32(4):649-655
16. Williams SM, Kaplan PA, Petersen JC, Leiberman RP. Mammography in women under age 30:Is there clinical benefit? *Radiology* 1986;161:49-51
17. Sergio Piccolo, Secondo Lastoria, Ciro Mainolfi et al. Technetium-99m-Methylene Diphosphonate scintimammography to image primary breast cancer . *J Nucl Med* 1995;36:718-724
18. H.Palmedo, F.Grunwald, H.Bender et al. Scintimammography with technetium-99m methoxyisobutylisonitrile: comparison with mammography and magnetic resonance imaging. *Eur J Nucl Med.* 1996;23:940-946.
19. Kao CH, Yong MD, Wang SJ et al. The Tc-99m MIBI scintigraphy in the evaluation of mass abnormalities of the breast. *Eur J Nucl Med* 1993;20:979(abs).
20. A Ozdemir, I I. Oznur, G Vural et al. Tl-201 scintigraphy, mammography and ultrasonography in the evaluation of palpable and nonpalpable breast lesions:a correlative study. *Eur J Rad* 1997;24: 145-154
21. Z. Burak, M. Argon, A. Memis et al. Evaluation of palpable breast masses with ^{99m}Tc-MIBI:a comparative study with mammography and ultrasonography. *Nucl Med Commun* 1994;15:604-612

Comparison between Mammography, Ultrasonography and ^{99m}Tc-MIBI Scintimammography in the Diagnosis of Breast Cancer¹

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Purpose: To compare the feasibility of ^{99m}Tc-MIBI scintimammography as a tumor localizing agent in breast lesions in comparison with that of mammography and ultrasonography, and to evaluate the efficacy of these three modalities.

Materials and Methods: Sixty-four breast lesions were classified as benign or malignant on the basis of sonographic and mammographic criteria and were further analyzed by means of ^{99m}Tc-MIBI scintimammography. The classifications thus obtained were compared with the biopsy findings, and in order to compare the three techniques, the sensitivity, specificity, accuracy, and negative and positive predictive values were calculated for each individual modality.

Results: Of 64 histologically proven lesions, 33 were malignant and 31 were benign. Sensitivities and specificities for malignancy were 86.2% and 64.5% for mammography, 87.9% and 76.7% for sonography, and 78.8% and 74.2% for ^{99m}Tc-MIBI scintimammography.

Conclusion: Mammography and ultrasonography are reliable diagnostic modalities for the detection of breast cancer. ^{99m}Tc-MIBI scintimammography has a higher specificity than mammography and it may help to reduce unnecessary biopsies.

Index words : Breast, neoplasm
Breast, radiography
Breast, radionuclide studies
Breast, US

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