

Application of Positron Emission Tomography (PET) in Postoperative Follow-Up of the Breast Cancer

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Purpose: Positron Emission Tomography (PET) is an imaging method that can diagnose diseases by detecting physiologic and biochemical changes of the body. In this study, we attempted to evaluate the value of PET in the postoperative follow-up of breast cancer.

Methods: From September, 1994 to December, 2001, postoperative PET was performed 67 times at Samsung Medical Center on 66 patients who underwent curative operation for breast cancer. Clinical outcomes were confirmed by clinicoradiologic courses, fine needle aspiration cytology, biopsy and operation. We reviewed the medical records and PET reports of these patients.

Results: The time interval between operation and PET ranged from 1 to 88 months with a median of 26.5 months. The PET results were abnormal physical examination (23 cases, 34.3%), equivocal result of bone scan (22 cases, 2.8%), other radiologic abnormalities (9 cases, 13.4%), abnormal laboratory findings (4 cases, 6.0%), and symptoms of patients (4 cases, 6.0%). Among the 67 PET studies, 48 were confirmed as having metastasis or recurrence, while 19 did not have metastasis or recurrence. Forty-five of the studies produced true positive results, 16 true negative, 3 false positive and 3 false negative. Therefore, in the detection of postoperative metastasis or recurrence of breast cancer the parameters for the use of PET were 93.8% sensitivity, 84.3% specificity, 93.8% positive predictive value, 84.3% negative predictive value and 91.0% accuracy. On the

basis of the lesion site, the accuracy of PET in the detection of bone (98.5%), lung (100%) and liver (98.5%) metastases was superior to that of local recurrence (85.1%) or lymph node metastasis (86.6%).

Conclusion: PET may be diagnostically helpful in a select subgroup of patients for whom findings remain inconclusive after performing conventional postoperative follow-up methods for breast cancer, especially in the detection of bone, lung and liver metastases. (*J Korean Surg Soc* 2002; 63:112-117)

Key Words: Breast cancer, PET, Postoperative follow-up, Metastasis, Recurrence

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(Positron Emission
Tomography, PET)
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PET 가
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1 PET 88 26.5 (Table 1), 가 가 23 가 , 가 가 22 , 가 9 , 가 4 , PET 가 4 , PET 가 PET가 PET 22 , PET 15 가 , PET PET 7 6 PET 5 PET Hanning filter (cutoff frequency, 8.0 mm) 128×129 (pixel size, 4.29×4.29 mm with a slice thickness of 4.25 mm) 9.8 mm, 10.1 mm ⁶⁸Ge rods 10 PET 3 PET 2 가 1 PET 가 PET 가 가 (50.8%) 가 18 12 3 가 .

Table 1. The reason for performing PET

	No. of case (%)
Abnormal physical examination	23 (34.3)
Equivocal bone scan result	22 (13.4)
Other radiologic abnormality	9 (13.4)
Abnormal laboratory finding	4 (6.0)
Symptom of patient	4 (6.0)
Others	4 (6.0)
Total	67 (100.0)

Table 2. The confirmation of clinical outcome

	No. of case (%)
Clinicoradiologic follow-up	34 (50.8)
Fine needle aspiration cytology	18 (26.9)
Biopsy	12 (17.9)
Operation	3 (4.5)
Total	67 (100.0)

PET (Table 3), 67 PET 15 , 12 , 3 가 .PET 48 , 45 , 13 PET 3 . PET 가 4 , PET 가 가 3 , 1 PET IIa 40 CA 15-3 가 , PET 93.8%, 84.3%, 91.0% 가 PET (Table 4) (Fig. 1) 15 가 PET 53.3%, 94.2%, 72.2%, 87.5%, 85.1% . 21 가 PET 86.6% . 26 (Fig. 2) 98.5%, 12 (Fig. 2) 98.5% , PET가 가 1 , , PET 가 IIb 11

Table 3. PET findings versus clinical outcomes

PET finding	Clinical outcome (No. of case)		Total
	Recurrence	No recurrence	
Normal	3	12	15
Benign	0	4	4
Recurrence	45	3	48
Total	48	19	67

Table 4. PET findings on the basis of the metastatic or recurrent site

PET finding (No. of case)	Metastatic or recurrent site					
	Local	LN*	Bone	Lung	Liver	Others
True positive	8	21	26	12	7	1
True negative	49	37	40	55	59	(-)
False positive	3	9	1	0	1	(-)
False negative	7	0	0	0	0	1
PET value (%)						
Sensitivity	53.3	100.0	100.0	100.0	100.0	(-)
Specificity	94.2	80.4	97.6	100.0	98.3	(-)
PPV [†]	72.7	70.0	96.3	100.0	87.5	(-)
NPV [‡]	97.5	100.0	100.0	100.0	100.0	(-)
Accuracy	85.1	86.6	98.5	100.0	98.5	(-)

*LN = lymph node; [†] PPV = positive predictive value; [‡] NPV = negative predictive value.

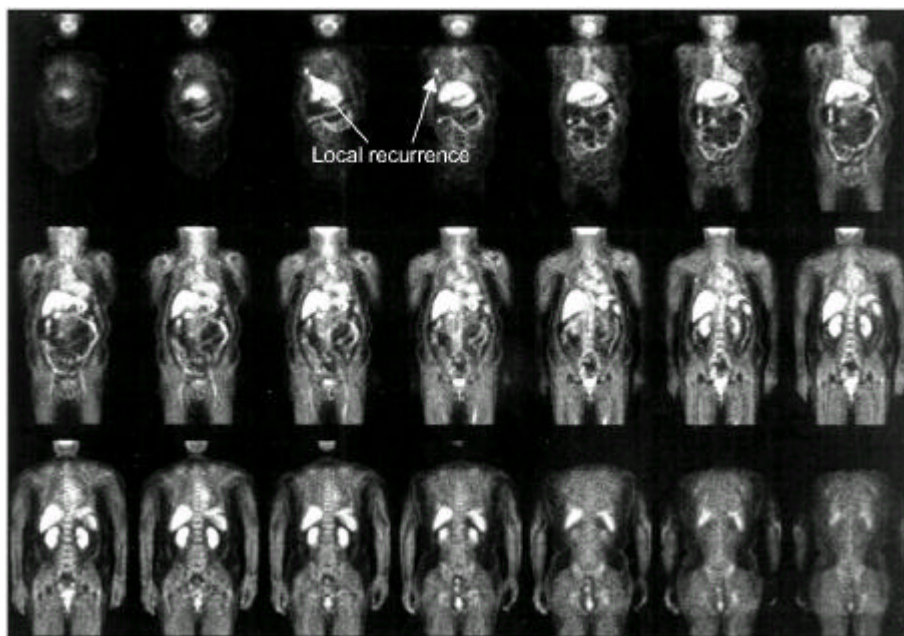


Fig. 1. FDG-PET finding of local recurrence. A 56 year old female was operated modified radical mastectomy for right breast cancer with stage IIa at June, 1999. She was examined with PET at November, 2001 for a palpable nodule on her anterior chest. Anterior coronal FDG-PET cuts showed intense hypermetabolic foci (arrows), consistent with local recurrence and wide excision of a nodule on chest wall confirmed local recurrence of breast cancer.

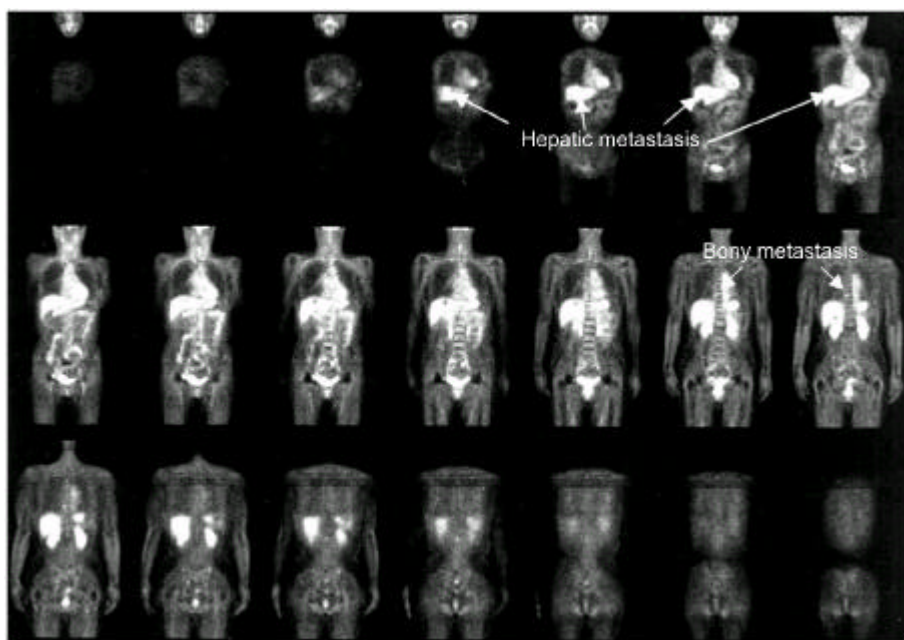


Fig. 2. FDG-PET finding of bony and hepatic metastasis. A 55 old female was operated modified radical mastectomy for right breast cancer with stage IIb at September, 1999. She was examined PET at November, 2001 because bony and hepatic metastases were suspicious on bone scan and liver computed tomography. Anterior coronal FDG-PET cuts revealed intense hypermetabolic foci at thoracic spine and liver (arrows), consistent with bony and hepatic metastases. The clinicoradiologic follow-up confirmed that she had bony and hepatic metastases.

PET PET PET (10) 가

PET PET fluorine-18

가 , 2-deoxy-2-fluoro-D-glucose (FDG)

PET (1-9) FDG-PET가

PET

100%, 98.5%, PET 8
15 53.3%
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91% 가 ,
가 가 ,
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PET
가 가 ,
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30 50% , PET 가
(12, 13) , PET
가 가 , PET
가 ,
(4)가 , Ohta (14) . Wahl (10)
FDG-PET 8 60 FDG 가
FDG-PET가 가 가
PET 100%, 97.6%, (9, 18)
96.3%, 100%, 98.5%
PET
85.1%, 86.6% 가
가 98.5%, 가

PET
가
PET
가
PET 가
FDG-PET가
PET가
PET가
가
PET
PET

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