
MAMMOGRAPHY OF THE IRRADIATED BREASTS

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Purpose : To evaluate the mammographic findings and role of detection of local recurrence in breast cancer patients, who underwent breast conserving surgery and radiation therapy.

Materials and methods : From 1988 to 1998, 78 women with early breast cancer (stage I,II) were treated with lumpectomy and axillary nodes resection, followed by radiation treatment. Mammographic imagings were taken yearly after complete treatment. Needle biopsy was done for suspected local recurrence on mammography.

Results : Duration of follow-up ranged from 3 years to 10 years. Seventy-three of 78 patients (93.6%) had evidence of parenchymal changes on serial annual mammography. Twenty-eight of 73 (38.4%) had diffuse dense parenchymal changes. Twenty-four of 73 patients (32.9%) had focal fibrotic changes, and 21 of 73 patients (28.8%) had evidence of parenchymal distortion with mass like lesion. Skin thickening was found in 54 of 78 patients (69.2%). Calcification was the least change, found in only 2 of 78 patients (2.6%). Nine of 78 patients (11.5%) had mammographic signs of local recurrence. Seven of 9 had suspected local recurrence by needle biopsy. Four of seven had proven of local recurrence on mastectomy, and 3 of 7 (42.8 %) had false positive on mastectomy.

Conclusion : Annual mammography in post breast conserving treatment showed beneficial results for detection of recurrent cancer with acceptable false positive rate.

INTRODUCTION

Many randomized trials had published the comparable results between breast conserving treatment and mastectomy.^{1,2,3,4} There was no statistically significant difference in the overall survival or disease-free survival. However, some reported a higher risk of local recurrence in breast conserving group than mastectomy group.²

In Thailand, breast cancer was the second most common cancer in women following cancer of the uterine cervix. Before the last decade, most of the early stages cancer (stage I and II) were treated by mastectomy. Because of the excellent

cosmetic result of breast conserving treatment, which assured woman self-esteem, this treatment protocol became more recognized and more popular as an alternative choice of treatment. However, the goals of cancer treatment were to obtain the cure rate and prolong disease-free survival. So, early detection of curable local recurrence was the most important challenge.

The purpose of this study were to evaluate the mammographic changes of post conserving treated breasts and the role of such changes in the detection of the local recurrences

in the earliest stage as possible.

MATERIALS AND METHODS

From 1988 to 1998, 78 women with pathological diagnosis of early stage of invasive ductal carcinoma were treated with breast conserving treatment.

Inclusion criterias:

1. Stage I and II invasive ductal carcinoma.
2. Primary tumor less than 5 cm in diameter.
3. No evidence of distant metastasis.

Exclusion criterias :

1. Multifoci carcinomas.
2. Presence of extensive intraductal carcinoma components.
3. Pendulous and fatty breasts.
4. Poor compliance for regular follow-up.

Treatment protocol :

Surgical procedure consisted of lumpectomy with axillary nodes dissection. Free surgical margin was required. Radiation therapy was started within 2-3 weeks after surgery. The radiation dose of 4500 - 5400 cGy with 5 - 5½ weeks was delivered to the affected breasts, using Linac 6 MV Therapy, both medial and lateral tangential fields technique.

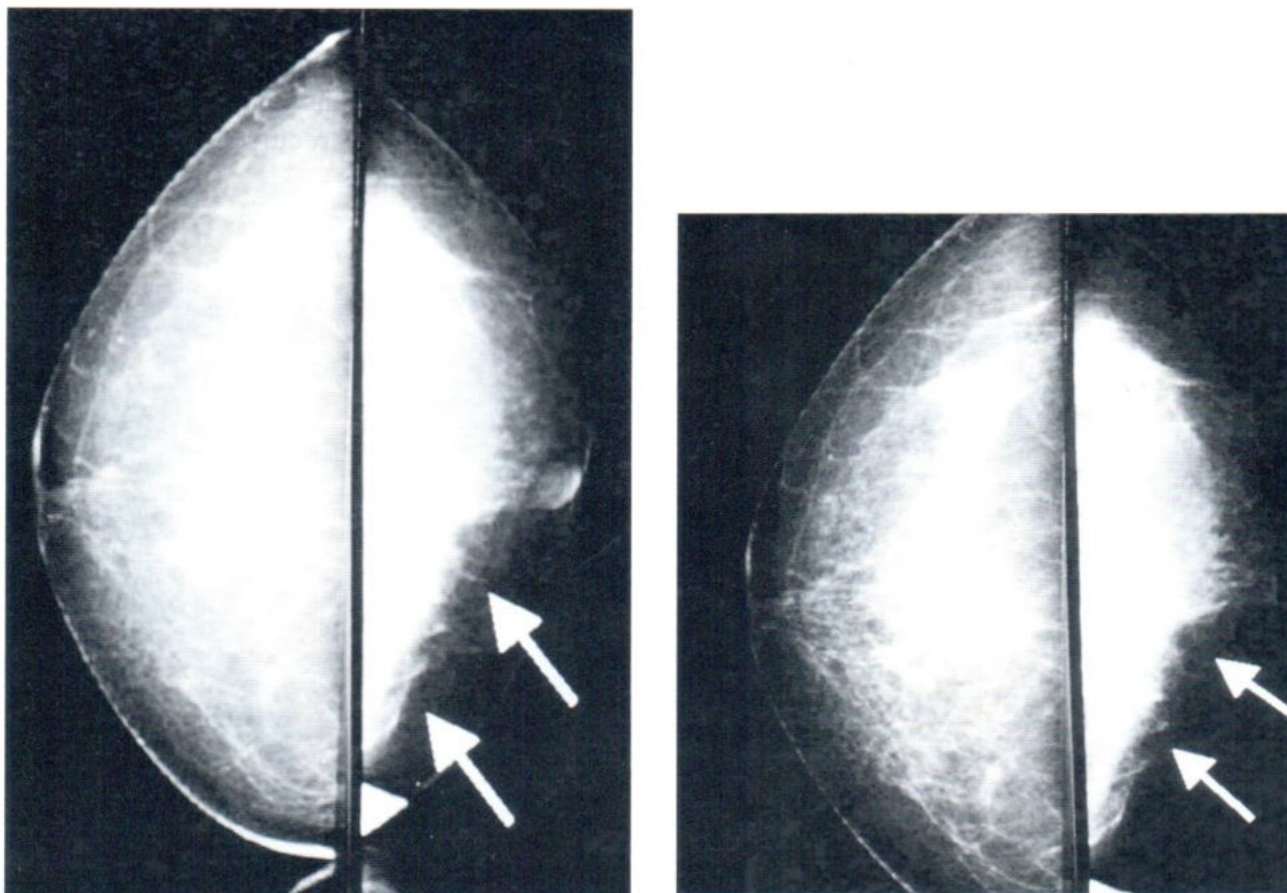
The surgical scars were boosted with additional 1000 cGy in 5 fractions with Electron beam.

Annual mammography was done after 12 months of radiation. Routine imaging consisted of cephalocaudad and lateromedial oblique views. Spot and magnification views were obtained in cases of interval changes. Needle biopsy was done in patients who had mammographic changes which suspected of local recurrence.

RESULTS

From 1988 to 1998, 78 women with pathological diagnosis of stage I and II invasive ductal carcinomas were included in the study. Age of the patients ranged from 26 years to 63 years, median age was 35 years. Primary tumor size ranged from 1 cm to 4 cm in diameter. The majority of patients had tumor less than 4 cm diameter, about 75 of 78 patients (96.2 %). Only 3 patients had 4 cm tumor masses. Duration of follow-up ranged from 3 to 10 years.

Parenchymal changes were the most common changes on mammography, accounted about 73 of 78 patients (93.6%). Twenty-eight of them showed diffuse dense parenchyma on mammography. Twenty-four of 73 patients (32.9%) had focal fibrotic changes, and 21 of 73 patients (28.8%) had parenchymal distortion with mass like lesions. Skin thickening was found in 54 of 78 patients (69.2%). Calcification was the least change, and was found in only 2 of 78 patients (2.6%). Most of the patients had more than one mammographic changes.



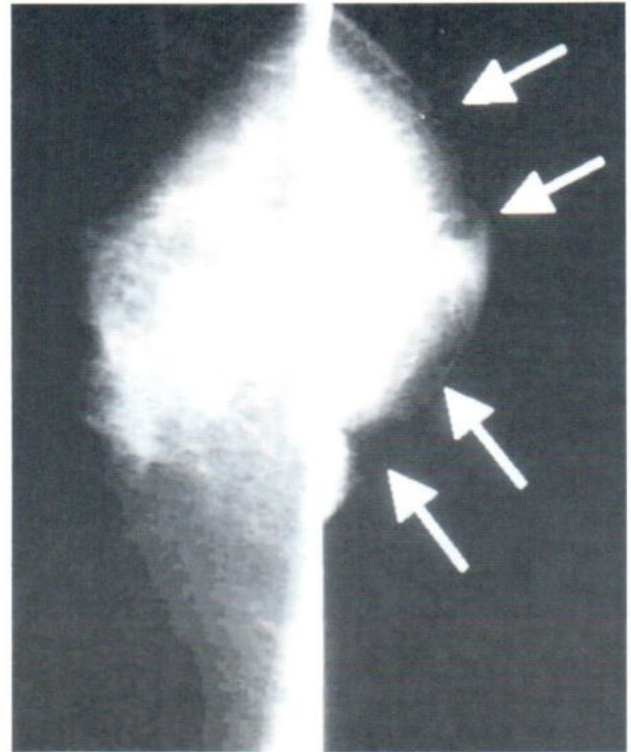
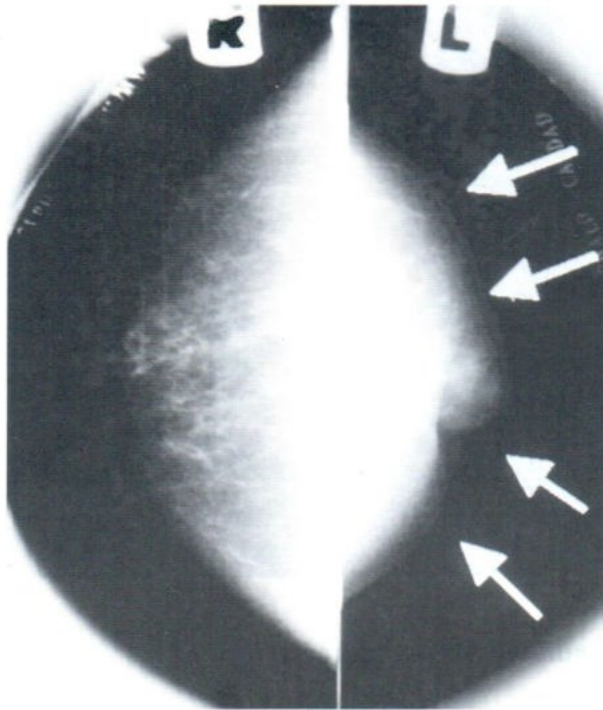
Focal fibrotic changes of the radiated breast (arrows)

Table showed mammographic findings.

Mammography findings		Number	Percentage
1.	Paenchymal changes	73	93.6%
	- diffuse dense	28	38.4%
	- focal fibrosis	24	32.9%
	- mass like with parenchymal distortion	21	28.8%
2.	Skin thickening	54	69.2%
3.	Calcification	2	2.6%
4.	No significant change	2	6.8%
Total		78 patients	

Nine of 78 patients had mammographic signs of suspected local recurrence, (criteria included new appearance of mass-like lesion with parenchymal distortion with or without palpable mass on physical examination). Seven of them had suspected malignant cells on needle biopsy. All

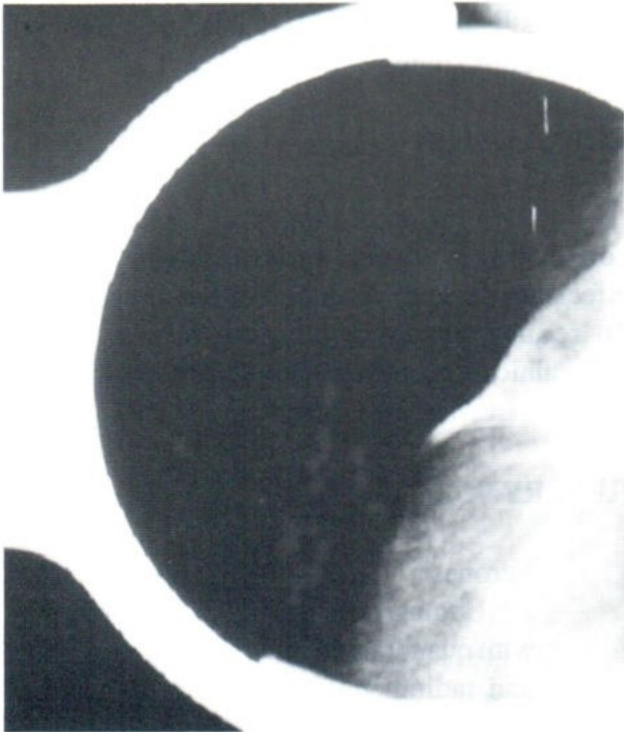
patients underwent mastectomy. Four of seven patients had proven recurrent invasive carcinoma in mastectomy specimens. The rest of 3 patients had false positive of recurrent carcinoma in mastectomy specimens.



Diffuse dense parenchymal changes of radistated breast

Case reported of false positive mammography : A 52 year woman was diagnosed as invasive ductal carcinoma, primary tumor about 3 cm in diameter. She underwent breast conserving surgery (pathological reported of free surgical margin, with negative involvement of all 16 dissected axillary nodes). She was treated with a complete course of radiation therapy within 10 days after surgery. The third of her annual follow-up mammography, a new mass-like lesion,

without microcalcification was found at the surgical scar. MR imaging with gadolinium-DTPA showed an enhanced lesion, suggestive of recurrent tumor. Fine-needle biopsy showed suspected malignant cells. Mastectomy was performed within 7 days. Pathological report showed a cluster of microabscesses with fibrosis of the suspected lesion, no evidence of malignant cells on surgical specimen (Picture shown below).



Mass-like lesion

DISCUSSION

In this decade, mammography was proven to be the gold standard for early detection of breast cancer. It showed to produce about 25-30% reduction in breast cancer mortality for screening program.^{5,6,7} However, false negative rate of cancer detection in mammography for screening program remained high, up to 15-20%.^{8,9,10,11} For breast cancer patients who underwent breast conserving surgery and radiation therapy, mammography also played an important role in the detection of local recurrence in the affected breast and possible cancer in the contralateral breast.

In this study, the main mammographic changes after conserving surgery and radiation was parenchymal tissue changes (either diffuse or focal). The diffuse parenchymal changes of increasing in breast density was secondary to radiation, while the focal changes of fibrosis, usually located at the surgical sites. The other feature of parenchymal change was the mass-like lesion with parenchymal distortion. There were about 21 of 78 patients (28.8%) in this study, having this change. The second most common change was skin thickening, which were accounted about 54 of 78 patients (69.3%). This finding was more common in Thai women than western women, which may due to rather smaller breasts among them. Calcification was rare in this study, occurred in only 2 patients, and appeared as dense benign calcifications.

The majority of patients whose mammographic findings mimic the signs of local recurrence in the affected breasts, (mass-like lesions with parenchymal distortion) showed stability of findings on closed serial studies. Only 9 patients demonstrated progression of changes, and the interventional cytology were performed. Seven of 9 patients had the findings of suspected malignant cells on fine-needle biopsy. Only 4 of

the 9 patients were proven of recurrent cancer in the mastectomy specimens. Two patients had false positive in the mastectomy specimens and evidence of fat necrosis and massive fibrosis noted at the surgical sites. Because of more concerned about false positive mastectomy, additional MR imaging was performed in the last patient (shown above). The MR imaging also showed an enhanced lesion at the surgical site. But the mastectomy specimen was shown to have a cluster of microabscesses.

The false positive result of MR imaging might be due to its limited specificity for cancer detection with reports of specificity ranged from 30 to 90 %, even it demonstrated a high sensitivity for the detection of abnormal breast lesions, both malignancy and some benign lesions, such as atypical hyperplasia and sclerosing adenosis.^{12,13,14,15} No case of false negative was noted in this study.

CONCLUSION

Annual mammography after breast conserving surgery and radiation showed efficiency in early detection of local recurrence. To reduce the false positive rate, a closed communication between surgeon, radiologist and pathologist was recommended.

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