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# The Effect of Breast Self-examination on Early Detection and Survival

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**To investigate the effect of breast self-examination (BSE), we compared the stages, survival, and the risk of death for 355 patients with breast cancer detected by BSE with those for 1,327 patients with breast cancer detected by chance. The early stages of the disease were found to be more common among the symptomatic breast cancer patients detected by BSE than those by chance. The 5-year overall survival rate was 94.4% for the symptomatic patients detected by BSE, and was significantly higher by 8.7% than that (85.7%) for patients detected by chance ($P<0.001$). The 10-year survival rate was 81.6% for patients detected by BSE, and 76.6% for cases detected by chance (the difference was not significant). The overall difference between the two survival curves was statistically significant by the logrank test ($P<0.01$). A multivariate analysis using the Cox proportional hazards model showed that the risk of death for patients detected by BSE was smaller by 0.570 times than that for patients detected by chance, which was statistically significant ($P<0.05$). The effect of biases inherent to BSE in the survival analysis cannot be controlled completely even after conducting multivariate analysis. These results suggest that BSE may contribute to the reduction of the risk of death through early detection of breast cancer. However, further examination should be conducted by other methods to obtain conclusive evidence.**

Key words: Breast self-examination — Breast cancer — Survival — Multivariate analysis

Breast self-examination (BSE) is a low-cost, low-risk method of breast cancer detection that every woman can easily perform regularly at her home. BSE procedure has been widely promoted for early detection of breast cancer in recent years in Japan, as well as in western countries. The Fifth National Survey on Malignant Neoplasms, carried out in 1989 by the Ministry of Health and Welfare of Japan, revealed that 92% of all the 3,268 municipalities of Japan promoted BSE programs in fiscal year 1988.[1)]

However, until recently, there had been little data on the effectiveness of BSE for early detection of breast cancer and prolongation of survival. Several investigators showed that self-examiners had smaller primary tumors, earlier clinical staging, or fewer axillary node metastases compared to non-examiners.[2-6)] Some other studies found no association between BSE and stage.[7,8)] In a few studies, the relationship between the practice of BSE and survival was evaluated. Foster and Costanza[9)] observed a 5-year survival rate of 75% for self-examiners compared to 57% for non-examiners. Huguley *et al.*[10)] showed that the 5-year survival rates from breast cancer were 76.7% among self-examiners and 60.9% among nonexaminers. The survival advantage for self-examiners persisted after

adjustment for some confounding factors. Locker *et al.*[11] reported the results of a study as part of the UK trial, in which no overall survival advantage was demonstrated for the study group compared with a group of historical controls, but attenders for BSE instruction had a significantly better actuarial survival than non-attenders.

The purpose of the present study is to examine whether BSE is beneficial or not for Japanese women. For this purpose, we compared the stages, prognosis and so on, for the symptomatic breast cancer patients with a lump or lumps in their breasts detected by BSE with those for the patients detected by chance, and also investigated the risk of death after adjusting for other relevant factors simultaneously by using the Cox proportional hazards regression model.[12]

## SUBJECTS AND METHODS

The subjects of the present study were a part of those described in the previous paper.[13] In brief, the Research Group on the Study of Mass Screening for Breast Cancer (chief researcher: S. Tominaga), organized in 1987 with the support of Grants-in-Aid from the Ministry of Health and Welfare of Japan, has conducted a collaborative study to assess the life-prolonging effect of mass screening for breast cancer. Medical records for 728 breast cancer patients detected by mass screening and 1,450 breast cancer patients found in out-patient clinics, matched for hospital, age and the time of treatment, were reviewed by physicians in 11 regions of Japan. In these regions, mass screening for breast cancer has been intensively conducted, and also BSE instruction programs have been widely promoted. The physicians involved were engaged in consultation both in mass screening for breast cancer and in out-patient clinics. They knew well the BSE procedure.

About two-thirds (66.5%, 484 cases) of the patients detected by mass screening and most (98.2%, 1,424 cases) of the patients detected in out-patient clinics had already found a lump or lumps in their breasts at a visit to screening/out-patient clinics (Table I). These symptomatic breast cancer patients with a lump or lumps in their breasts were reviewed by the physicians to find out whether they had recognized a lump or lumps at a regular BSE practice ("by BSE" group) or not ("by chance" group). Out of the above patients, 355 cases were detected by BSE, and 1,327 cases by chance (Table II).

To evaluate the effect of BSE, we compared several characteristics such as the clinical stages, survival, and the risk of death for the symptomatic breast cancer patients with a lump or lumps detected by BSE with those for the patients detected by chance.

Table I. Distribution of the Breast Cancer Patients by Symptom and Detection Method

| Symptom | No. of subjects (%) | | | | | |
|---|---|---|---|---|---|---|
| | Mass screening | | Out-patient clinic | | Total | |
| Absent | 235 | (32.3) | 18 | (1.2)** | 253 | (11.6) |
| Present | 484 | (66.5) | 1,424 | (98.2)** | 1,908 | (87.6) |
| Unspecified | 9 | (1.2) | 8 | (0.6) | 17 | (0.8) |
| Total | 728 | (100.0) | 1,450 | (100.0) | 2,178 | (100.0) |

** $P<0.01$ — compared to the patients detected by mass screening.

Table II. Distribution of Breast Cancer Patients with Symptoms by Mode of Detection and Method of Detection

| Mode | No. of subjects (%) | | | | | |
|---|---|---|---|---|---|---|
| | Mass screening | | Out-patient clinic | | Total | |
| by BSE | 130 | (26.9) | 225 | (15.8)** | 355 | (18.6) |
| by Chance | 281 | (58.1) | 1,046 | (73.5)** | 1,327 | (69.5) |
| Unspecified | 73 | (15.1) | 153 | (10.7)* | 226 | (11.8) |
| Total | 484 | (100.0) | 1,424 | (100.0) | 1,908 | (100.0) |

* $P<0.05$, ** $P<0.01$ — compared to the patients detected by mass screening.

Cumulative survival rates were calculated by the actuarial method[14] for the followed-up patients (347 cases detected by BSE and 1,322 cases by chance). A significance test for the difference between survival rates at a certain point of time was done based on standard errors of cumulative survival rates estimated by using Greenwood's formula. The overall difference between the survival curves over an observed period was evaluated by using the logrank test.[15]

A multivariate analysis of factors related to the survival was carried out by using the Cox proportional hazards regression model to investigate the joint effect of factors such as mode of detection, year of treatment, histological type, age at initial treatment and detection method.[12]

## RESULTS

**The stage and histologic type of breast cancer** Out of the 484 symptomatic breast cancer patients detected by mass screening, 130 cases (26.9%) were detected by BSE, and 281 cases (58.1%) by chance (Table II). Out of the 1,424 symptomatic patients diagnosed in out-patient clinics, 225 cases (15.8%) were detected by BSE, and 1,046 cases (73.5%) by chance.

Table III. Histological Type of Breast Cancer for the Symptomatic Breast Cancer Patients by Mode of Detection and Method of Detection

| Histological type | No. of subjects (%) detected | | | | | |
|---|---|---|---|---|---|---|
| | by BSE | | | by chance | | |
| | Mass scr. | Out-pat. | Sub-total | Mass scr. | Out-pat. | Sub-total |
| Papillotubular ca. | 37 (28.5) | 69 (30.7) | 106 (29.9) | 67 (23.8) | 254 (24.3) | 321 (24.2)* |
| Solid-tubular ca. | 28 (21.5) | 78 (34.7) | 106 (29.9) | 91 (32.4) | 322 (30.8) | 413 (31.1) |
| Scirrhous ca. | 46 (35.4) | 46 (20.4) | 92 (25.9) | 89 (31.7) | 336 (32.1) | 425 (32.0)* |
| Lobular ca. | 5 (3.8) | 2 (0.9) | 7 (2.0) | 4 (1.4) | 19 (1.8) | 23 (1.7) |
| Others | 12 (9.2) | 28 (12.4) | 40 (11.3) | 27 (9.6) | 99 (9.5) | 126 (9.5) |
| Unspecified | 2 (1.5) | 2 (0.9) | 4 (1.1) | 3 (1.1) | 16 (1.5) | 19 (1.4) |
| Total | 130 (100.0) | 225 (100.0) | 355 (100.0) | 281 (100.0) | 1,046 (100.0) | 1,327 (100.0) |

* $P<0.05$ — compared to the breast cancer patients detected by BSE.

Table IV. Distributions of Stage at Diagnosis for the Symptomatic Breast Cancer Patients by Mode of Detection and Method of Detection

| | No. of subjects (%) detected | | | | | |
|---|---|---|---|---|---|---|
| | by BSE | | | by chance | | |
| | Mass scr. | Out-pat. | Sub-total | Mass scr. | Out-pat. | Sub-total |
| Clinical stage | | | | | | |
| Tis | 8 (6.2) | 9 (4.0) | 17 (4.8) | 10 (3.6) | 34 (3.3) | 44 (3.3) |
| I | 43 (33.1) | 72 (32.0) | 115 (32.4) | 83 (29.5) | 256 (24.5) | 339 (25.5)** |
| II | 65 (50.0) | 130 (57.8) | 195 (54.9) | 143 (50.9) | 572 (54.7) | 715 (53.9) |
| IIIa, IIIb | 11 (8.5) | 13 (5.8) | 24 (6.8) | 40 (14.2) | 158 (15.1) | 198 (14.9)** |
| IV | 3 (2.3) | 1 (0.4) | 4 (1.1) | 5 (1.8) | 21 (2.0) | 26 (2.0) |
| Unspecified | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 5 (0.5) | 5 (0.4) |
| Total | 130 (100.0) | 225 (100.0) | 355 (100.0) | 281 (100.0) | 1,046 (100.0) | 1,327 (100.0) |
| T-classification | | | | | | |
| Tis, T0 | 3 (2.3) | 9 (4.0) | 12 (3.4) | 7 (2.5) | 22 (2.1) | 29 (2.2) |
| T1 | 43 (33.1) | 77 (34.2) | 120 (33.8) | 91 (32.4) | 276 (26.4) | 367 (27.7)* |
| T2 | 65 (50.0) | 131 (58.2) | 196 (55.2) | 142 (50.5) | 570 (54.5) | 712 (53.7) |
| T3 | 5 (3.8) | 5 (2.2) | 10 (2.8) | 18 (6.4) | 76 (7.3) | 94 (7.1)** |
| T4 | 5 (3.8) | 3 (1.3) | 8 (2.3) | 19 (6.8) | 85 (8.1) | 104 (7.8)** |
| Unspecified | 9 (6.9) | 0 (0.0) | 9 (2.5) | 4 (1.4) | 17 (1.6) | 21 (1.6) |
| Total | 130 (100.0) | 225 (100.0) | 355 (100.0) | 281 (100.0) | 1,046 (100.0) | 1,327 (100.0) |
| N-classification (macroscopic) | | | | | | |
| N0 | 42 (32.3) | 103 (45.8) | 145 (40.8) | 112 (39.9) | 340 (32.5) | 452 (34.1)* |
| N1a, N1b | 73 (56.2) | 111 (49.3) | 184 (51.8) | 146 (52.0) | 621 (59.4) | 767 (57.8)* |
| N2 | 5 (3.8) | 9 (4.0) | 14 (3.9) | 17 (6.0) | 47 (4.5) | 64 (4.8) |
| N3 | 1 (0.8) | 1 (0.4) | 2 (0.6) | 1 (0.4) | 20 (1.9) | 21 (1.6) |
| Unspecified | 9 (6.9) | 1 (0.4) | 10 (2.8) | 5 (1.8) | 18 (1.7) | 23 (1.7) |
| Total | 130 (100.0) | 225 (100.0) | 355 (100.0) | 281 (100.0) | 1,046 (100.0) | 1,327 (100.0) |

* $P<0.05$, ** $P<0.01$ — compared to the breast cancer patients detected by BSE.

As to the histological type of breast cancer, papillotubular carcinoma was more common among patients detected by BSE, and scirrhous carcinoma was more common among patients detected by chance (Table III).

The frequency distributions of the clinical stage, T-classification, and N-classification (UICC, 1978) at the time of diagnosis are shown in Table IV for the symptomatic breast cancer patients detected by BSE and by

Table V. Distribution of Regional Lymph Node Metastasis at Diagnosis for the Symptomatic Breast Cancer Patients by Mode of Detection and Method of Detection

| Lymph node metastasis | No. of subjects (%) detected | | | | | |
|---|---|---|---|---|---|---|
| | by BSE | | | by chance | | |
| | Mass scr. | Out-pat. | Sub-total | Mass scr. | Out-pat. | Sub-total |
| n-classification (histological) | | | | | | |
| n0 | 78 (60.0) | 136 (60.4) | 214 (60.3) | 163 (58.0) | 579 (55.4) | 742 (55.9) |
| n1$\alpha$ | 27 (20.8) | 53 (23.6) | 80 (22.5) | 61 (21.7) | 231 (22.1) | 292 (22.0) |
| n1$\beta$ | 10 (7.7) | 18 (8.0) | 28 (7.9) | 22 (7.8) | 99 (9.5) | 121 (9.1) |
| n2 | 8 (6.2) | 16 (7.1) | 24 (6.8) | 24 (8.5) | 96 (9.2) | 120 (9.0) |
| n3+n4 | 1 (0.8) | 1 (0.4) | 2 (0.6) | 4 (1.4) | 23 (2.2) | 27 (2.0) |
| No surgery | 0 (0.0) | 0 (0.0) | 0 (0.0) | 6 (2.1) | 9 (0.9) | 15 (1.1)* |
| Unspecified | 6 (4.6) | 1 (0.4) | 7 (2.0) | 1 (0.4) | 9 (0.9) | 10 (0.8)* |
| Total | 130 (100.0) | 225 (100.0) | 355 (100.0) | 281 (100.0) | 1,046 (100.0) | 1,327 (100.0) |

* $P<0.05$ — compared to the breast cancer patients detected by BSE.

Table VI. Distribution of Year of Initial Treatment for the Symptomatic Breast Cancer Patients by Mode of Detection and Method of Detection

| Year of treatment | No. of subjects (%) detected | | | | | |
|---|---|---|---|---|---|---|
| | by BSE | | | by chance | | |
| | Mass scr. | Out-pat. | Sub-total | Mass scr. | Out-pat. | Sub-total |
| 1968–1974 | 1 (0.8) | 5 (2.2) | 6 (1.7) | 17 (6.0) | 51 (4.9) | 68 (5.1)** |
| 1975–1979 | 19 (14.6) | 14 (6.2) | 33 (9.3) | 80 (28.5) | 281 (26.9) | 361 (27.2)** |
| 1980–1984 | 59 (45.4) | 121 (53.8) | 180 (50.7) | 121 (43.1) | 471 (45.0) | 592 (44.6)* |
| 1985–1987 | 51 (39.2) | 85 (37.8) | 136 (38.3) | 63 (22.4) | 243 (23.2) | 306 (23.1)** |
| Total | 130 (100.0) | 225 (100.0) | 355 (100.0) | 281 (100.0) | 1,046 (100.0) | 1,327 (100.0) |

* $P<0.05$, ** $P<0.01$ — compared to the breast cancer patients detected by BSE.

chance, and detected by mass screening and in out-patient clinics. The proportion of stage I was larger in patients detected by BSE than in those detected by chance (32.4% vs. 25.5%; $P<0.01$). In contrast, the proportion of stage III was smaller in the former group than the latter group (6.8% vs. 14.9%; $P<0.01$). As to the T-classification the proportion of T1 was larger in patients detected by BSE than in those detected by chance (33.8% vs. 27.7%; $P<0.05$), while the proportion of T3 plus T4 was smaller in the former group than the latter group (5.1% vs. 14.9%; $P<0.01$). As to the macroscopic N-classification, the proportion of negative metastasis was larger in the cases detected by BSE than in those detected by chance (40.8% vs. 34.1%; $P<0.05$).

As to the histological n-classification, the proportion of negative metastasis in the axillary lymph nodes was slightly larger in patients detected by BSE than in those detected by chance (60.3% vs. 55.9%; statistically not significant) (Table V).

The age distributions of the symptomatic breast cancer patients at the time of initial treatment were similar

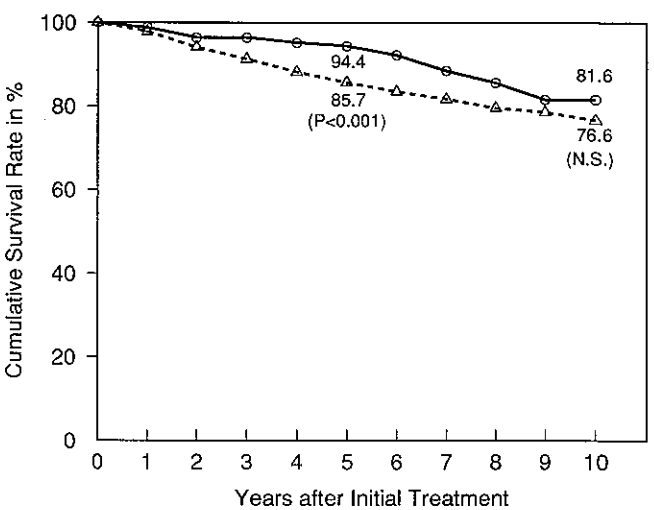


Fig. 1. Cumulative survival rates for 347 symptomatic breast cancer patients detected by BSE (○) and for 1,322 patients detected by chance (△).

between the cases detected by BSE and those by chance. However, the percentage of the symptomatic breast cancer patients, treated initially in recent years, especially since 1980, was higher among the patients detected by BSE than those detected by chance (Table VI).

**Prognosis** The 5-year overall survival rate for the symptomatic breast cancer patients detected by BSE (N=347) was higher by 8.7% than that for patients detected by chance (N=1,322) (94.4% vs. 85.7%; $P<0.001$) (Fig. 1). The 10-year overall survival rate for patients detected by BSE was higher by 5.0% than that for those detected by chance (81.6% vs. 76.6%; statistically not significant). The overall difference between the two survival curves was statistically significant by the logrank test ($P<0.01$).

The Cox proportional hazards regression approach was employed to evaluate the independent prognostic effect of BSE with adjustment for the influence of other relevant factors. Ordinal factors were recoded as shown in Table VII.

The results of a multivariate analysis are shown in Table VIII using the Cox regression model in which mode of detection, year of treatment, histological type, age at initial treatment, and detection method were included as the independent variables. Mode of detection was found to be significantly related to the survival ($P<0.05$), as well as year of treatment and histological type. The risk of death for patients detected by BSE was 0.570 times that for patients detected by chance.

Table VII. Values/Scores of Variables Used in the Cox Regression Model

| Prognostic factor | Values/Scores |
|---|---|
| Mode of detection | 1: BSE, 2: by Chance |
| Year of treatment | 1: 1968–1979, 2: 1980–1987 |
| Histological type | 1: Papillo-tubular, 0: Others |
| Age at initial treatment | Age of each patient |
| Detection method | 0: Mass screening,<br>1: Out-patient clinics |

## DISCUSSION

At present, there is insufficient evidence that BSE is effective in reducing mortality from breast cancer. A randomized controlled trial is considered to be the most accurate method to evaluate the effectiveness of BSE. The prospective randomized controlled trial of BSE education sponsored by the World Health Organization (WHO) is in progress in the USSR (in Leningrad and Moscow).[16] As it is not planned to use mammography for screening in the USSR, this will provide a test of the effectiveness of BSE under circumstances where other screening modalities for breast cancer are not being adopted. A preliminary report of the USSR/WHO trial in Leningrad[17] demonstrated a shortening of the time between detection and the visit to a doctor in the intervention group, 3 months as opposed to 4 months in the control group, and also showed decreased average size of tumor at diagnosis (3.2 cm in the BSE group versus 4.5 cm in the control group). It will take several years for this trial to establish whether BSE is effective or not in reducing mortality from breast cancer.

A non-randomized trial of BSE education is in progress as the National Trial of Early Detection of Breast Cancer in the United Kingdom (the multicenter UK trial), in which mortality in two health districts, where every women aged 45–64 has been invited to a BSE class, will be compared with that in two screening districts and four control districts.[18] Within the city of Nottingham, one of the districts of the UK trial, survival rate in a group of patients invited to attend for BSE education was compared with that in a group of historical controls.[11] No overall survival advantage was demonstrated for the study group, but within this study group, attenders for

Table VIII. Multivariate Analysis of Factors Related to Survival in the Cox Regression Model for Symptomatic Breast Cancer Patients

| Factor | Regression coefficient (B) | Standard error of B | $t$-value | Statistical significance level ($P$) | Risk ratio (fav./unfav.)[a] |
|---|---|---|---|---|---|
| Mode of detection | 0.562 | 0.233 | 2.42 | $<0.05$ | 0.570 (BSE/by chance) |
| Year of treatment | −0.408 | 0.138 | −2.95 | $<0.01$ | 0.665 (1980–87/1968–1979) |
| Histological type | −0.415 | 0.168 | −2.48 | $<0.05$ | 0.661 (papillo-tub./others) |
| Age at initial treatment | 0.012 | 0.006 | 1.91 | NS | 0.696 (30 yr/60 yr) |
| Detection method | 0.242 | 0.155 | 1.56 | NS | 0.785 (screening/out-pat. clinics) |

*a*) Risk ratio for favorable characteristic versus unfavorable one.

BSE education had a significantly better actuarial survival than non-attenders.

Foster and Costanza[9] found that survival rate at 5 years was 75% for self-examiners versus 57% for non-examiners from the data on the 836 invasive breast cancer patients in 15 general hospitals in Vermont, USA. Significant survival differences persisted after adjustment for the effects of age, method of detection, family history of breast cancer, and delay in treatment.

Huguley *et al.*[10] showed the 5-year observed survival rates from breast cancer were 76.7% among self-examiners and 60.9% among non-examiners in 14 hospitals in Georgia, USA. The survival advantage for self-examiners persisted after adjustment for some confounding factors.

Ogawa *et al.*[2] demonstrated that more frequent practice of BSE was associated with more favorable clinical stage and with smaller average size of breast tumor in Japanese women, suggesting that this may lead to a more favorable prognosis. They showed in their preliminary report[19] that the survival was better among self-examiners than that among non-examiners ($P<0.05$).

In our present study, unfortunately, no detailed information on BSE performance such as the frequency and technique of BSE before detection of symptoms was included. The patients who had already recognized a lump or lumps in their breasts by themselves at a visit to screening/out-patient clinics were reviewed by the physicians to find out whether they had detected a lump or lumps by BSE or by chance. We compared clinical stage and prognosis of the "by BSE" group of symptomatic breast cancer patients with the "by chance" group. In our study design, the patients who performed BSE regularly, but failed to recognize a lump or lumps at a regular BSE practice, were classified into the "by chance" group. As a result, we may be under-estimating the favorable effect of BSE, if we evaluate it by comparing the survival difference between the patients detected by BSE and those by chance with the survival difference between BSE-performers and non-performers. Early stage breast cancers were significantly more common in the patients detected by BSE than those detected by chance. The 5-year survival rate was significantly higher in the patients detected by BSE than in those detected by chance ($P<0.001$), while the 10-year survival rate was higher, but the difference was not significant.

A multivariate analysis using the Cox regression model indicated that mode of detection was significantly related to survival ($P<0.05$), as well as year of treatment and histological type (Table VIII). General treatment methods for breast cancer could have been improved in recent years, and the patients with papillotubular type of carcinoma might have the most favorable prognosis. The risk of death for symptomatic patients with lumps in their breasts detected by BSE was 0.570 times that for those detected by chance. This may be partly due to the effect of BSE through earlier detection, and partly due to biases such as length bias, lead time bias and self-selection bias in favor of BSE. The effect of such biases inherent to BSE in the survival analysis cannot be controlled completely even after conducting multivariate analysis, such as the Cox proportional hazards model. The results of the present study provide some suggestion that BSE may contribute to the reduced risk of death through the detection of breast cancers at an early stage. However, the effectiveness of BSE, especially in reducing mortality from breast cancer, needs further study by other methods.

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