Survival rates for breast cancers detected in a community service screening mammogram program

Stephen F. Sener, M.D.\textsuperscript{a,*}, David J. Winchester, M.D.\textsuperscript{a}, David P. Winchester, M.D.\textsuperscript{a}, Ermilo Barrera, M.D.\textsuperscript{a}, Malcolm Bilimoria, M.D.\textsuperscript{a}, Erika Brinkmann, M.D.\textsuperscript{a}, Eihab Alwawi, B.S.\textsuperscript{a}, Sarah Rabbitt, B.S.N.\textsuperscript{a}, Miles Schermerhorn\textsuperscript{a}, Hongyan Du, M.Sc.\textsuperscript{b}

\textsuperscript{a}Department of Surgery, Evanston Northwestern Healthcare and Northwestern University Feinberg School of Medicine, Evanston, IL, USA
\textsuperscript{b}Center for Outcomes Research and Education (CORE), Evanston Northwestern Healthcare and Northwestern University Feinberg School of Medicine, Evanston, IL, USA

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Abstract

**Background:** This single-institution long-term prospective study was performed in the setting of community service screening mammography to evaluate the association between the methods of breast cancer detection and survival rates.

**Methods:** From 1994 through 2001, data on 1237 patients with breast cancer were collected concurrent with definitive surgical treatment and entered into a comprehensive database.

**Results:** Mammography was the sole method of detection for 517 (44%) of 1179 Tis-T2 breast cancers. Fifty-seven percent of invasive cancers detectable by mammography alone were less than 1 cm in diameter. For 1049 patients with invasive cancers, the 5-year overall observed survival rates were 94\% for 372 whose cancers were detectable by mammogram alone and 87\% for 677 whose cancers were detectable by palpation (alone or in combination with mammography) ($P = .0002$).

**Conclusions:** Most of the contribution to breast cancer mortality reduction is from the detection of small nonpalpable cancers, not from adjuvant therapy. © 2006 Excerpta Medica Inc. All rights reserved.

Keywords: Breast cancer; Screening mammography; Survival

Breast cancer mortality rates in the United States were stable from the mid 1970s until 1989. From then through 1995, there was a nationwide average mortality decline of 1.6\% per year, followed by an average decline of 3.4\% per year from 1996 through 1999 [1] (Fig. 1). There has been considerable discussion as to whether this mortality reduction was attributable to advances in systemic adjuvant treatment, more aggressive implementation of screening programs, or a combination of both [2,3]. Because of the implications for national policy and resource allocation, it is important to differentiate between these factors.

This single-institution long-term prospective study was performed in the setting of community service screening mammography to evaluate the associations between the methods of breast cancer detection, adjuvant treatment, and survival rates.

**Methods**

From 1994 through 2001, demographic, diagnostic, and treatment data on all patients with breast cancer (including ductal carcinoma-in-situ [DCIS]) treated by a group of 6 surgeons were collected concurrently with definitive surgical treatment. After obtaining informed consent, data were entered into a comprehensive database approved by the institutional review board. The method of detection was assigned by the surgeon at the time of diagnosis according to whether the cancer was detectable by mammography or physical examination, not by which test initially detected the cancer. Multivariate Cox proportional hazard models (forward selection method), log-rank tests, and Kaplan-
Meier survival plots were used to assess variables and survival for 1237 consecutive patients.

Results

The mean tumor size was 1.4 cm overall, 1.1 cm for nonpalpable cancers, and 1.9 cm for palpable cancers. For 1179 Tis-T2 breast cancers, the tumors were detectable by mammography alone for 517 (44%), palpation alone (false-negative mammograms) for 158 (13%), and mammography plus palpation for 504 (43%) (Table 1). Tis (in-situ) cancer accounted for 16% of cancers overall and 29% of cancers detectable by mammogram alone. Four percent of DCIS patients presented with a mass and a negative mammogram. T1a and T1b cancers (<1 cm) accounted for 27% of cancers overall and 57% of invasive cancers detectable by mammogram alone. Rates of regional lymph node involvement were 8% for T1a cancers, 13% for T1b cancers, 31% for T1c cancers, and 46% for T2 cancers.

Observed overall 5-year survival rates were 96% for 528 patients whose cancers (including DCIS) were detectable by mammogram alone, 86% for 532 patients with cancers detectable by mammogram plus palpation, and 86% for 177 patients with cancers detectable by palpation alone (false-negative mammogram) (P < .0001). Using a multivariate Cox proportional hazard model, the survival analysis for 1049 patients with invasive cancers demonstrated that stage, age, and method of detection were statistically significant variables. The observed 5-year overall survival rates for patients with invasive cancers was 94% for 372 cancers detectable by mammogram alone and was 87% for 677 cancers detectable by palpation (alone or with mammography) (P = .0002). (Fig. 2).

As shown in Fig. 3, of the 677 patients whose cancers were detectable by palpation (alone or with mammography), 184 (27%) had adjuvant chemo-hormone therapy, 335 (49%) had adjuvant chemotherapy or hormone therapy, and 144 (21%) had no adjuvant systemic therapy. Of the 372 patients whose cancers were detectable only by a screening mammogram, 40 (11%) had adjuvant chemo-hormone therapy, 168 (45%) had adjuvant chemotherapy or hormone therapy, and 148 (40%) had no adjuvant systemic therapy. Treatment data were missing for 16 patients with cancers detectable only by mammography and for 14 patients with palpable cancers.

However, most interesting was the observation that for the 677 patients with palpable cancers, the treatment effect on survival rates was statistically significant (P = .0003), whereas there was no significant treatment effect on survival rates for 372 patients whose cancers were detectable only by mammography.

Comments

The widespread use of adjuvant systemic treatment for breast cancer has resulted in a proportional reduction in
mortality of about 25% with tamoxifen and about 33% with chemotherapy. However, as the results in Fig. 3 confirmed, the largest absolute reduction in mortality with adjuvant systemic treatment was in patients with larger (palpable) cancers, more likely to be node-positive. Given the fact that 37% of invasive cancers were detectable only by screening mammography and were thus associated with a reduced risk of metastases, the proportional impact of adjuvant therapy on mortality was unchanged but the absolute impact became negligible.

In contrast, it was estimated that in the Swedish Two-County studies there was a 50% to 67% proportional mortality reduction by screening 85% of women aged 40 to 74 years at 30-month intervals [4]. In that report, 39% of cancers were discovered in the time interval between screenings. With annual screening of 90% of this population, only 11% of cancers would have been detected in the interval between screenings and the mean tumor diameter would have been about 1 cm, with a node-positive rate of about 10%.

It is clear that both early detection and adjuvant therapy have contributed to breast cancer mortality reductions. Yet, the greatest potential to reduce breast cancer deaths is through the contribution of screening to reduce the incidence rate of advanced disease. The relative contribution toward mortality reduction of screening has become more pronounced as screening programs have become more successful at detecting smaller (more node-negative) cancers.

The key factor in mortality reduction for screening is to assure that patients at substantial risk for metastases actually receive treatment [5]. Although the data generated herein represented a local community experience with breast screening, they substantiated the hypothesis that most of the contribution to breast cancer mortality reduction in the United States over the last 15 years has been from the detection of small nonpalpable cancers, not from adjuvant therapy.

During the last 5 years, data supporting the efficacy of screening mammography have undergone intensive re-examination, and the benefits of regular screening have been reaffirmed [6]. However, the ultimate potential of this screening tool has yet to be realized. Data from the Behavioral Risk Factor Surveillance System (BRFSS) of the National Center for Chronic Disease Prevention and Health Promotion (Centers for Disease Control and Prevention) demonstrated that the median percentage of US women at or over 40 years of age not having a mammogram “within the last 2 years” dropped from 41.7% in 1990 to 27.2% in 1999 [7]. And, in 2000 the BRFSS estimated that 62.6% of US women over 40 years of age had a mammogram “within the last year.” But, as stated by Spencer et al., “If 90% of American women between the ages of 40 and 75 years were given annual screening mammograms, breast cancer mortality would likely be reduced by two thirds” [8].

References


Discussion

N.E. Joseph, M.D. (Philadelphia, PA): Your data certainly suggest that early detection through screening has a significant impact on survival.

Many studies that show that there is a less of a reduction in mortality for those patients between the ages of 40 and 49 when compared to those over the age of 50, did you see any specific differences related to age in your analysis?

Approximately 30% of your patients had DCIS, and do you think that having such a large population of DCIS patients has greatly biased your results?

Was there any standardization to which patients received chemotherapy and which did not? For example, did all...
patients who would have been considered candidates for chemotherapy by standard criteria, actually receive chemotherapy?

S.F. Sener, M.D. (Evanston, IL): We have done a former analysis of age and found women who are over 50 years of age have a better survival than those who are under 50 years of age. For patient’s 50 to 69, 69, and older break out does not appear to be much different. Perhaps the most telling thing I can tell you about this data set is that, first of all, it is a multifactorial problem in young women. Tumors have a worse prognosis just because of the grade and the stage of presentation. But in our cohort, for women under 50, fully 20% of those women had false-negative mammography. That is the most telling factor related to age in this cohort.

The second question was about DCIS and the potential bias of DCIS and survival analysis, and I thoroughly agree with that comment, and, for that reason, we have actually segregated the DCIS patients from the invasive cancer patients for the survival analysis.

The third question was related to standardization of adjuvant therapy. I cannot prove that there is standardization to you, but there are several mechanisms by which we homogenize the recommendations in our institution. We have a breast conference every week where every patient is discussed. We have a small number of medical oncologists who have a uniform treatment philosophy and, in general, people with tumors over 1 cm in diameter get a recommendation for adjuvant therapy. My anecdotal experience is that about 80% of those patients actually follow those recommendations.

Willard S. Stawski, M.D. (Grand Rapids, MI): It seems to me observing the American Cancer Society statistic’s over the years, that the situation with breast cancer is perhaps analogous to that in the decline in mortality in colorectal cancer with the incidence of colonoscopy and the removal of premalignant lesion, we have seen a pretty dramatic reduction. I would suggest the same is true of breast cancer, when you can pick these things up by mammography. I think that is what you are telling us, is it not?

S.F. Sener, M.D. (Evanston, IL): Yes. I think so.

Brian S. Shapiro, M.D. (Flint, MI): Do you presently use a MRI in a screening tool for breast cancer, and, if so, how?

S.F. Sener, M.D. (Evanston, IL): We have an institutional MRI protocol, and we only use it for high-risk women in the screening setting. We do use it for diagnostic purposes in other contexts, but for screening, we have limited it to high-risk women.

Brian S. Shapiro, M.D. (Flint, MI): What have your results been? Have you been happy with it? Are you detecting small tumors?

S.F. Sener, M.D. (Evanston, IL): Yes, there is an improved sensitivity with MRI; however, there is a substantial learning curve for the radiologist that results in a high false-positive rate. Our false-positive rate for the first 2 years in our MRI experience approached one third.