Regional Differences in the Incidence and Treatment of Carcinoma in Situ of the Breast

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Abstract
Greater use of mammography in the United States in recent years has increased the detection of early neoplasms of the breast, including carcinoma in situ. However, the occurrence and treatment of diagnosed carcinoma in situ of the breast has not been fully described. Our goal was to examine temporal, geographic, and demographic patterns in the incidence and treatment of in situ breast cancer. The study included data from all women with in situ breast cancer that had been detected in the nine Surveillance, Epidemiology, and End Results areas of the United States from 1975 through 1990 (Surveillance Program, Cancer Statistics Branch, Bethesda, MD: National Cancer Institute, November, 1993). We calculated age-adjusted incidence rates (1970 United States standard) using data on histology and treatment from the Surveillance, Epidemiology, and End Results data tape. We assessed predictors of treatment by mastectomy using multiple logistic regression. From 1975–1979 to 1986–1990, the age-adjusted incidence rate of in situ breast cancer increased from 4.7 to 16.9/100,000 women. The increase occurred in all age groups and among both white and black women. However, there was nearly a 2-fold difference in incidence rates across geographic areas in 1986–1990, ranging from <12/100,000 in Iowa and New Mexico to >20/100,000 in San Francisco and Seattle. Geographic variability in treatment was also evident, with mastectomy, rather than breast-conserving therapy, performed on 46% of the women with in situ breast cancer in San Francisco and on 66% of those in Iowa. The incidence of diagnosed in situ breast cancer increased markedly during the 1980s, and there was substantial geographic variability in the rates of detection of these tumors and in the type of therapy received. Although mastectomy became a less common treatment over time, it was still performed on a high proportion of women with in situ breast cancer during the latter part of the decade.

Introduction
Efforts to increase mammographic screening of asymptomatic women have become more intense and successful in recent years, resulting in the diagnosis of more breast cancers at an earlier stage (1–3). In particular, diagnoses of DCIS and LCIS have become more common in recent years (4, 5), but the extent and consequences of the increasing rate of diagnosis of these in situ lesions have not been fully explored. Also, physicians have been uncertain about the best management of in situ breast cancer (6), and this uncertainty could result in differing approaches to diagnosis and treatment in various areas of the country.

We used population-based data from nine areas of the United States for patients diagnosed from 1975 through 1990 to examine time trends and geographic and demographic patterns of in situ breast cancer.

Materials and Methods
Our analyses were based on data from tapes provided by the SEER program of the United States National Cancer Institute for the period 1975–1990 (7). The SEER program is a system of population-based cancer registries supported by the National Cancer Institute to track cancer incidence and survival in the United States (7). The SEER registries cover nine geographic areas: the metropolitan areas of San Francisco-Oakland, California; Detroit, Michigan; Atlanta, Georgia; and Seattle-Puget Sound, Washington; and the states of Connecticut, Utah, New Mexico, Iowa, and Hawaii. SEER program data are abstracted from medical records and include information on race, age at diagnosis, primary site, stage, morphology, initial treatment plan, cause of death, and follow-up information.

We used the SEER data tape to develop an analysis file of 12,647 women who were diagnosed with microscopically confirmed in situ breast cancer between January 1975 and December 1990. Excluded from this file were women who had a concomitant invasive breast cancer and women who were diagnosed at autopsy or whose death certificate was the only source of diagnostic information. We classified diagnoses as DCIS or LCIS according to the morphology codes recorded on the SEER tape. We categorized surgical treatment as mastectomy and breast-conserving surgery. Mastectomy consisted of simple or total mastectomy (with or without node dissection) and modified radical or radical mastectomy with dissection of axillary lymph nodes. Breast-conserving surgery included excisional biopsy, lumpectomy, or partial mastectomy (with or without dissection of axillary lymph nodes).

Age-specific incidence rates were adjusted by the direct method to the 1970 United States standard population. To

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2 The abbreviations used are: DCIS, ductal carcinoma in situ; LCIS, lobular carcinoma in situ; SEER, Surveillance, Epidemiology, and End Results; EAPC, estimated annual percent change; CI, confidence interval.
Results

The age-adjusted incidence rates for in situ breast cancer in the SEER areas was relatively constant from 1975 through 1982, but tripled from 1983 through 1987 before leveling off. Most of the increase was due to DCIS; its incidence rate grew from 3.4/100,000 women in 1982 to 15.1/100,000 in 1990 (EAPC, 21.4; 95% CI, 15.7–27.4%). Over the same period, LCIS incidence increased less acutely, from 1.3/100,000 women in 1982 to 3.3/100,000 in 1990 (EAPC, 12.6; 95% CI, 6.8–18.8%; Fig. 1).

Incidence of in situ breast cancer increased among both white and black women and in all age groups studied (Fig. 2). The incidence rates, however, tended to be slightly higher among whites in both the earlier (1975–1983) and later (1984–1990) years of the study (Fig. 2).

In situ breast cancer incidence rates varied widely among the nine SEER areas (Table 1). From 1975 through 1979, New
Mastectomy includes simple or total mastectomy (with or without node dissection) and modified radical or radical mastectomy with dissection of axillary lymph nodes. By the period of 1986–1990, in situ breast cancer accounted for only 4% of all breast cancers diagnosed in the SEER areas; by 1986–1990 this figure had risen to 10%.

The proportion of women diagnosed with in situ breast cancer who were treated with mastectomy decreased slightly during the period studied; from 59 (1983–1985) to 53% (1986–1990). However, there was substantial geographic variability in the mode of treatment received by women with in situ breast cancer (Table 2). During the period 1986–1990, Iowa had the lowest proportion (3.2/100,000 women) and Atlanta had the highest proportion (11.2/100,000 women) of women with in situ breast cancer who were treated with mastectomy. In Connecticut, San Francisco, and Seattle, fewer than 50% of women with in situ breast cancer were treated with mastectomy from 1986 through 1990.

Mastectomy was used relatively more often to treat women who were diagnosed in the early 1980s or who had a histological diagnosis of DCIS (as opposed to LCIS; Table 3).

Specifically, the odds ratio of receiving mastectomy was only 0.39 (95% CI, 0.31–0.49) for women diagnosed in 1990 relative to those diagnosed in 1983. Likewise, women with DCIS had an odds ratio for mastectomy of 1.61 (95% CI, 1.45–1.79) relative to women with LCIS. The logistic regression analysis also confirmed the large geographic variation in treatment type, with women in New Mexico, Iowa, and Atlanta having odds of mastectomy that were 2- to 3-fold higher than those for women in San Francisco, the group with the lowest frequency of mastectomy (Table 3).
Discussion

The results of these analyses confirm previously published reports that diagnosis of carcinoma in situ of the breast increased during the 1980s (4, 5), an increase for which the most likely explanation is heightened use of mammographic screening (1-4, 9). Surveys conducted in the United States through 1990 have shown that the prevalence of mammography screening increased progressively over time among adult women (10). However, the incidence of in situ breast cancer appears to have plateaued in 1987. The reasons for this plateau in the rates are not clear, although plausible explanations are depletion of the pool of prevalent cases, temporal changes in the risk patterns of the women undergoing mammography, or changes in the criteria for performing breast biopsy after mammography.

Our analyses show that in situ breast cancer incidence rates did not increase uniformly across all SEER areas and that the in situ breast cancer incidence rates themselves varied widely. The variations do not seem to result primarily from underlying differences in breast cancer occurrence among the various SEER areas. From 1986 through 1990 there was relatively little difference in invasive breast cancer incidence or mortality rates (e.g., the age-adjusted mortality rates for breast cancer in the states of California, Washington, and Iowa were 27.0, 26.6, and 25.9/100,000 women, respectively (11), despite the fact that the incidence rate of in situ cancer was nearly twice as high in Seattle and San Francisco as in Iowa.

Despite emerging evidence about the efficacy of breast-conserving approaches to management of in situ cancers (11-14), mastectomy remained the most frequent treatment for this condition throughout the 1980s. However, there has been substantial geographic variation in the use of mastectomy for in situ breast cancer. This result was also suggested in a previous analysis of SEER data from the period 1983-1988 and could not be readily explained by differences in tumor size or other patient characteristics (15). Geographic variation has also been reported in the use of mastectomy (versus breast-conserving therapy) for invasive breast cancer, with mastectomy performed more often in areas with sparse populations (16). However, the SEER data do not show a clear pattern of greater use of mastectomy among rural populations. In fact, the highest use of mastectomy was in metropolitan Atlanta. During the 1980s, the therapeutic approach to DCIS shifted, as surgical opinion came to favor lumpectomy (with or without radiation therapy) as an alternative to mastectomy (6, 14). Our analysis of the SEER data indicates that adoption of the breast-conserving approach has been uneven. Although, over time, the use of mastectomy as a treatment declined in almost all areas, it declined unevenly, and in one area, Iowa, there was a move toward more frequent mastectomy.

In situ breast cancer is not a life-threatening condition, and relatively few major epidemiological studies have examined its etiology or treatment. Nevertheless, as our data indicate, recognition of in situ breast cancer has increased dramatically in the United States, and in situ cancers may now account for up to one-tenth of all diagnosed breast neoplasms. Thus, carcinoma in situ of the breast clearly merits further study, not only as an etiological precursor to invasive cancer but also as an important cause of morbidity and health care expenditures.

References

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