Male Breast Cancer Incidence Among Atomic Bomb Survivors

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To learn more about the role of ionizing radiation in the development of male breast cancer, we evaluated male breast cancer incidence among 45880 male members of the Life Span Study cohort of Japanese atomic bomb survivors. Male breast cancers, diagnosed between January 1, 1958, and December 31, 1998, were identified through the Hiroshima and Nagasaki Tumor Registries. Nine male breast cancers were diagnosed among exposed Life Span Study members (crude rate = 0.5 per 100 000 person-years), and three were diagnosed among nonexposed cohort members (crude rate = 0.5 per 100 000 person-years). A statistically significant dose–response relation was observed (excess relative risk per sievert = 8, 95% confidence interval = 0.8 to 48; P = .01). Our finding of a statistically significant association between ionizing radiation and male breast cancer incidence adds to the very limited information that shows an association between radiation exposure and an increased risk of male breast cancer. [J Natl Cancer Inst 2005;97:603–5]

Male breast cancer is relatively infrequent throughout the world and generally accounts for less than 0.5% of cancers in males and about 1% of all breast cancers (1). In Japan, however, the incidence of both male and female breast cancer is particularly low (1). The incidence of male and female breast cancers differs in terms of age patterns, with the age of onset being greater for male breast cancer patients than for female breast cancer patients (2). Anatomically, the male breast is similar to an undeveloped breast of a prepubescent girl. It consists primarily of fatty and fibrous tissues without many ducts or lobular elements (3). Decreasing levels of androgens in older men can result in some ductal proliferation occurring in their breasts.

Because of the rarity of breast cancer in males, the etiology of this disease is not well described, but some risk factors are similar to those observed for female breast cancer—e.g., family history of breast cancer, higher social class, and Jewish religion (4). Ionizing radiation is a well-known risk factor for female breast cancer (5,6). Among atomic bomb survivors, the incidence of female breast cancer increases linearly with radiation dose, with age at exposure or attained age modifying the radiation risk (6). Much less is known about radiation as a risk for male breast cancer, although based on personal interviews, a history of prior diagnostic or therapeutic medical radiation exposure was associated with male breast cancer in a large population-based case–control study conducted in the United States (7). An increased risk of male breast cancer was found 20 years or more after exposure, but risk appeared to diminish 30–40 years after exposure. To learn more about the role of ionizing radiation in the development of male breast cancer, we examined male breast cancer incidence among members of the well-established Life Span Study cohort of atomic bomb survivors (6,8).

Male breast cancers were identified through the Hiroshima and Nagasaki Tumor Registries and other medical records related to members of the Life Span Study. Because the tumor registries were established in 1958, analyses were restricted to Life Span Study members who were alive and cancer-free at that time. Two study pathologists (T. Ikdea and S. Tokuoka) reviewed pathology specimens or reports and classified diagnoses according to the World Health Organization histologic criteria (9). Individual breast doses in sieverts (Sv) were computed with DS02, the new Life Span Study dose estimation system (10). The study population was 45880 male Life Span Study members who met the study criteria: 32411 who received a known radiation dose, 2978 who received appreciable doses but for whom doses could not be computed because of complicated or unknown shielding, and 10491 Hiroshima or Nagasaki residents who were not in the cities at the time of the bombings. Cancer incidence follow-up was through December 31, 1998. Risks were estimated with simple age-adjusted excess relative risk models (8,11). Hypothesis tests and confidence intervals were based on maximum-likelihood methods (12).

Between January 1, 1958, and December 31, 1998, nine male breast cancers were diagnosed among exposed Life Span Study cohort members (crude rate = 1.8 per 100 000 person-years), including seven cases among survivors with known dose and two among members with unknown dose. Three male breast cancers were diagnosed among cohort members who were not in city at the time of the bombings (crude rate = 0.5 per 100 000 person years). Although detailed dose–response analyses were not possible with only 12 cases, a radiation effect was evident (Table 1), and a statistically significant age-adjusted trend with dose was observed (P = .01). The excess relative risk per sievert was estimated as 8 (95% confidence interval = 0.8 to 48), but, as indicated by the wide confidence interval, the risk estimate was imprecise.

Age at diagnosis among male breast cancer patients ranged from 42 to 88 years. The mean age was 67 years, which is 7 years older than the mean age for female breast cancer patients in this cohort. Only one patient was diagnosed when younger than age 50 years.

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of breast cancer with an increasing number of self-reported x-ray examinations was observed, which was statistically significant for exams performed between 1933 and 1963 (7). After radiation therapy, a marginally elevated risk was observed for men first treated before 1954, and the risk was somewhat higher when the location of the treatment field resulted in exposure to the breast. Because the number of radiation-exposed individuals was limited and doses were not available, evaluation of age and time effects was limited: Age at radiation exposure was not statistically significantly related to breast cancer risk, and risk was increased only 20–35 years after radiation exposure. The occurrence of male breast cancer has been reported infrequently in cohorts of radiation-exposed subjects. Because of the lack of radiation doses in several of the studies and the very small number of cases in all of them, meaningful quantified risks could not be estimated (13–17).

The long latency seen in our study was consistent with that previously reported (7); however, excess risks were still apparent 40 years or more after exposure. It is of interest that, in the Life Span Study, radiation-associated breast cancers were observed earlier among women (6) than among men (this study), but this difference could be because of the few patients with male breast cancers rather than biologic variation.

Because male breast cancer is a rare disease, few cases were seen in this 40-year follow-up of a large cohort. However, the results clearly show an association between exposure to external radiation and the occurrence of male breast cancer. This study sheds some light on age and time patterns of risk, but, because of the small numbers of patients, the radiation risks could not be quantified precisely.

**References**


NOTES

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