Effect of radiation exposure on survival after first solid cancer[1] diagnosis in A-bomb survivors

RERF Life Span Study (LSS)[2] analyses have revealed that that atomic bomb radiation effects differ in excess relative risk (ERR)[3] of solid cancer morbidity (incidence of illness) and mortality (death) among A-bomb survivors. A possible explanation is that chromosomal mutations caused by radiation exposure might heighten cancer's aggressiveness or weaken patients' ability to tolerate cancer treatments, thereby affecting mortality following cancer diagnosis.

Against that backdrop, this study analyzed radiation effects on survival following cancer diagnosis, with a focus on whether the subsequent death was caused by the first solid cancer, other cancer, or non-cancer disease in 20,463 individuals, excluding 2,075 with only death certificate records from among the 22,538 people in the LSS study cohort diagnosed with a first solid cancer during the period 1958–2009.

We found that the effect of radiation exposure before solid cancer diagnosis on mortality risk from the first solid cancer was not statistically significant — in other words there was no evidence of radiation effect on mortality in cases of first solid cancer. Nevertheless, deaths from other cancers and noncancer diseases were found to be associated with radiation dose.[4] There are potentially multiple reasons for different A-bomb radiation effects between solid cancer morbidity and mortality in the LSS, but this study suggests that a radiation effect on death from first solid cancer following diagnosis is probably not one of these reasons.

Notes

[1] Solid cancer:
Refers to cancer that forms a mass in organs or tissues other than hematopoietic cancers such as stomach cancer, lung cancer, liver cancer, colon cancer, among others. The "first solid cancer" indicated in the text above refers to the initial appearance of cancer.

[2] Life Span Study (LSS):
The main purpose of this study is to investigate the long-term effects of atomic bomb radiation on the cause of death and cancer incidence. At the time of the 1950 national population census in Japan, about 94,000 atomic bomb survivors were selected from among those who were confirmed to be in Hiroshima and/or Nagasaki at the time of the atomic bombings and about 27,000 who were not in city at the time. This study has tracked over many years about 120,000 subjects.

[3] Excess relative risk (ERR):
The increase or decrease of a certain health risk in an exposed group compared with a control group. An excess relative risk of 0 means that radiation exposure did not affect risk. An excess relative risk of 1 in the exposed group would indicate a rate of disease that is double the rate in the unexposed, or control, group.

[4] Association between radiation and first solid cancer, other cancer, or non-cancer disease:
The "excess hazard," a number indicating how much a disease affects rates of survival and mortality, was 0.038 for the first solid cancer but 0.38 for other cancers. Non-cancer diseases showed an excess hazard of 0.24. The larger this number, the higher the mortality risk. A more detailed explanation can be found in the paper.

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RERF's objective with this brief outline is to succinctly explain our research for the lay public. Much of the technical content of the original paper has been omitted. For further details about the study, please refer to the full paper published by the journal.