

Session 5.1

Thyroid Disease among A-bomb Survivors Exposed in Childhood

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The Life Span Study (LSS) of A-bomb survivors at RERF includes about 13,000 who experienced the bombing before age 5 years, and another 9,500 at ages 5-9. The thyroid doses ranged from <1 mGy to >3 Gy. The study shows that thyroid cancer risk from radiation exposure continues for 60 years or more. Statistical analyses indicated that a linear model fit the data across the entire dose range reasonably well. The estimates of the excess relative risk (ERR) and excess absolute risk (EAR) are similar to those from most of the other studies of thyroid cancer after exposure to external radiation (e.g., x-rays) or to iodine-131 from Chernobyl. The relative risk at 1 Gy was 2.3 (95% CI 1.6, 3.7) at 60 years of age after exposure at age 10, and the corresponding excess absolute risk at 1 Gy was 3.0 (95% CI 1.4, 5.0) per 10,000 person-years. In the earlier years after exposure the relative risks for those of ages 0-4 were as high as 10-fold after a 1 Gy thyroid dose. The study clearly shows that those exposed at early ages are at the highest risk of radiation-related thyroid cancer, whereas there is little risk after exposure in adulthood. For those under 10 years of age at exposure, a close examination of the dose-response association did not reveal an elevation of thyroid cancer risk among those with thyroid doses <100 mGy, but that finding is uncertain because the relatively small numbers of cancers in that group limit the statistical power and precision. An approximately linear dose response for both thyroid cancer and benign thyroid nodules was seen in the RERF clinical screening program of the Adult Health Study (AHS). For those who were in utero at the time of the bombings, 55 years later the relative risk at 1 Gy was similar to the risk estimate for those exposed in childhood, but the finding was not statistically significant due to the small size of the in utero cohort. The RERF studies make a valuable contribution to our knowledge about radiation-related thyroid cancer risk because of the wide range of well-characterized thyroid doses and of ages at exposure, the long-term follow-up and high-quality tumor registries in Hiroshima and Nagasaki, along with a thyroid screening program for the AHS subgroup of survivors.