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Paediatric

Radiation Dose and Volume to the Pancreas and Subsequent Risk of Diabetes Mellitus: A Report from the Childhood Cancer Survivor Study.

Friedman DN, Moskowitz CS, Hilden P, Howell RM, Weathers RE, Smith SA, Wolden SL, Tonorezos ES, Mostoufi-Moab S, Chow EJ, Meacham LR, Chou JF, Whitton JA, Leisenring WM, Robison LL, Armstrong GT, Oeffinger KC, Sklar CA.

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BACKGROUND

Childhood cancer survivors exposed to abdominal radiation (abdRT) are at increased risk for diabetes mellitus, but the association between risk and radiation dose and volume is unclear.

METHODS

Participants included 20762 five-year survivors of childhood cancer (4568 exposed to abdRT) and 4853 siblings. For abdRT, we estimated maximum dose to abdomen; mean doses for whole pancreas, pancreatic head, body, tail; and per cent pancreas volume receiving no less than 10, 20, and 30 Gy. Relative risks (RRs) were estimated with a Poisson model using generalised estimating equations, adjusted for attained age. All statistical tests were two-sided.

RESULTS

Survivors exposed to abdRT (median age = 31.6 years, range = 10.2–58.3 years) were 2.92-fold more likely than siblings (95% confidence interval [CI] = 2.02 to 4.23) and 1.60-times more likely than survivors not exposed to abdRT (95%CI = 1.24 to 2.05) to develop diabetes. Among survivors treated with abdRT, greater attained age (RRper 10 years = 2.11, 95% CI = 1.70 to 2.62), higher body mass index (RRBMI 30+ = 5.00, 95% CI = 3.19 to 7.83 with reference BMI 18.5–24.9), and increasing pancreatic tail dose were associated with increased diabetes risk in a multivariable model; an interaction was identified between younger age at cancer diagnosis and pancreatic tail dose with much higher diabetes risk associated with increasing pancreatic tail dose among those diagnosed at the youngest ages ($P < 0.001$). Radiation dose and volume to other regions of the pancreas were not statistically significantly associated with risk.

CONCLUSIONS

Among survivors treated with abdRT, diabetes risk was associated with higher pancreatic tail dose, especially at younger ages. Targeted interventions are needed to improve cardiometabolic health among those at highest risk.