

Risk of hematological malignancies from CT radiation exposure in children, adolescents and young adults

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Over one million European children undergo computed tomography (CT) scans annually. Although moderate- to high-dose ionizing radiation exposure is an established risk factor for hematological malignancies, risks at CT examination dose levels remain uncertain. Here we followed up a multinational cohort (EPI-CT) of 948,174 individuals who underwent CT examinations before age 22 years in nine European countries. Radiation doses to the active bone marrow were estimated on the basis of body part scanned, patient characteristics, time period and inferred CT technical parameters. We found an association between cumulative dose and risk of all hematological malignancies, with an excess relative risk of 1.96 (95% confidence interval 1.10 to 3.12) per 100 mGy (790 cases). Similar estimates were obtained for lymphoid and myeloid malignancies. Results suggest that for every 10,000 children examined today (mean dose 8 mGy), 1–2 persons are expected to develop a hematological malignancy attributable to radiation exposure in the subsequent 12 years. Our results strengthen the body of evidence of increased cancer risk at low radiation doses and highlight the need for continued justification of pediatric CT examinations and optimization of doses.

The use of computed tomography (CT) has grown rapidly in most high-income countries¹ since its introduction² at the beginning of the 1970s. Although the benefits of CT imaging in patient management are undisputed, the potential increased cancer risk³ and relatively high cumulative doses incurred from multiple scans have raised concerns

in the medical and scientific community, leading to a plateauing/reduction in number of pediatric CTs in many countries^{4–6} and a reduction in pediatric doses⁷. A number of alternative modalities, including fast-acquisition magnetic resonance imaging and ultrasonography are now replacing CT examinations for specific pediatric

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