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Brain cancer after radiation exposure from computed tomography examinations of children and young adults: results from the EPI-CT cohort study

Lyon, France, 7 December 2022 – A new study by scientists from the International Agency for Research on Cancer (IARC) and partners evaluates the risk of brain cancer in children and young adults who underwent computed tomography (CT) examinations. The study, published in *The Lancet Oncology*,¹ shows a significant dose–response relationship between CT-related radiation dose and risk of brain cancer, and stresses the importance of justifying CT examinations in young people and lowering the radiation dose as much as is reasonably achievable.

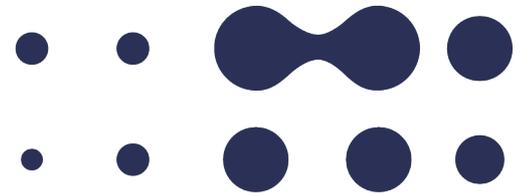
CT examinations provide essential diagnostic information, which is sometimes life-saving. However, patients are exposed to much higher radiation doses than those associated with chest X-rays and most other radiological diagnostic procedures.

“Several previous studies have suggested that head CT examinations in children are associated with an increased risk of brain cancer,” says Dr Michael Hauptmann, a professor at Brandenburg Medical School in Neuruppin, Germany, and the first author of the article. “However, precise and robust estimates of the cancer risk in relation to the CT radiation dose were missing and were urgently needed to inform dose optimization strategies.”

Researchers from IARC and partner institutions analysed data from 658 752 children who had received one or more CT examinations. They found that per 10 000 children who received one head CT examination, 1 radiation-associated brain cancer is expected during the 5–15 years after the CT examination.

This research is part of the European EPI-CT cohort study, which is coordinated by IARC and is the largest international study to date on cancer risks in young patients who underwent CT examinations. About 1 million children from 276 hospitals in 9 European countries are involved in the cohort.

¹ Hauptmann M, Byrnes G, Cardis E, Bernier M-O, Blettner M, Dabin J, et al. (2022). Brain cancer after radiation exposure from CT examinations of children and young adults: results from the EPI-CT cohort study. *Lancet Oncol*. Published online 6 December 2022. [https://doi.org/10.1016/S1470-2045\(22\)00655-6](https://doi.org/10.1016/S1470-2045(22)00655-6)



Individual radiation doses to various organs were reconstructed using historical machine settings and a large sample of CT images. Cohort members were linked with cancer registries and vital status registries to determine which children developed cancer. The results showed a statistically significant linear dose–response relationship for brain cancer. The excess relative risk of brain cancer per 100 milligray radiation dose to the brain was 1.27 (95% confidence interval, 0.51–2.69).

Obtaining evidence on CT-related risks of cancer in children is challenging because (i) randomized data are unavailable, (ii) the rarity of cancer in children requires studies with very large sizes, and (iii) the medical reason for which the CT examinations were performed can influence the estimated risks. The EPI-CT researchers addressed these issues and concluded that the observed association is unlikely to be due to such influences.

“The risks observed in the study are small. However, they are important at the population level because millions of paediatric head CT examinations are performed annually in European and other countries,” says IARC scientist Dr Ausrele Kesminiene, the coordinator of the EPI-CT study. “These results emphasize the need to adhere to the basic principles of radiological protection in medical practice to ensure that this valuable diagnostic procedure is used as appropriately as possible.”

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