

Interventional cardiology in children and radiation-induced cancer risk

Baysson H.(1), Journy N. (1), Dreuil S. (1), Girodon B. (2), Malekzadeh-Milani S. (2), Boudjemline Y. (2), Etard C. (1), Laurier D. (1), Bonnet D. (2), Bernier M.O. (1).

Institut de Radioprotection et de Sûreté Nucléaire, Fontenay aux Roses, France.(1); Centre de Référence Malformations Cardiaques Congénitales Complexes, M3C Hôpital Necker-Enfants Malades, Université Paris Descartes, Paris, France (2)

Objectives. Children with congenital heart disease frequently undergo interventional cardiology procedures (ICP) for diagnostic or therapeutic purposes. Despite the clear clinical benefit to the patient, the complexity of these procedures may result in high cumulative radiation exposure. This issue is particularly relevant for children given their greater sensitivity to radiation and the longer life span during which radiation health effects can occur. Epidemiological data are, however, still awaited for providing a lifelong overview of potential cancer risks. In France, an epidemiological cohort study, named Coccinelle (French acronym for « Ladybird »), is carried out. The specific objectives of this nationwide study are to characterise the paediatric population that underwent ICP in France; to estimate doses associated with ICP procedures and finally to assess the hypothesis of an excess risk of solid cancers and leukaemia attributable to ionising radiation exposure during ICP in children.

Methods. All children who have undergone at least one ICP before age 10 since 2000 are included from main French hospitals. For each ICP, dosimetric parameters (kerma area product, fluoroscopy time) are retrieved retrospectively. Organ doses, especially to the lung, breast, thyroid, and bone marrow are calculated using dedicated software. Children's exposure to CT scans, which account for a major contribution to their medical exposure dose, is also collected. Long term follow up of the cohort will be performed by linkage with French paediatric cancer registries. In the meantime, a quantitative risk assessment approach allows giving predictions of potential lifetime risks of cancer incidence.

Results. Up to now, about 9,000 children have been included. The cohort profile will be presented as well as reference levels for the main ICP performed. Using this exposure data, excess risks of leukaemia, breast, lung and thyroid cancers will be calculated using dose–response models derived from the Japanese atomic bomb survivors' cohort and from studies of medical exposures.

Conclusion. The Coccinelle study is specifically designed to provide further knowledge on the potential cancer risk associated with paediatric ICP. It will also provide comprehensive information on typical levels of doses for ICP in France.