Risk of cancer associated with cardiac catheterization procedures during childhood: a cohort study in France

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Objective: Children with congenital heart disease frequently undergo cardiac catheterization procedures for diagnostic or treatment purposes. Despite the clear clinical benefit to the patient, the complexity of these procedures may result in high cumulative radiation exposure. Given children's greater sensitivity to radiation and the longer life span during which radiation health effects can develop, an epidemiological cohort study is being launched in France to evaluate the risks of leukaemia and solid cancers in this specific population.

Methods: The study population will include all children who have undergone at least one cardiac catheterization procedure since 2000 and were under 10 years old and permanent residents of France at the time of the procedure. Electronically stored patient records from the departments of paediatric cardiology of the French national network for complex congenital heart diseases (M3C) are being searched to identify the children to be included. The minimum dataset will comprise: identification of the subject, characteristics of the procedure and technical details, such as fluoroscopy time and dose area product (DAP), which are needed to reconstruct the doses received by each child. The cohort will be followed up through linkage with the two French paediatric cancer registries, which have recorded all cases of childhood leukaemia and solid cancers in France since 1990 and 2000, respectively. Radiation exposure will be estimated retrospectively for each child included in the cohort. Organ doses, especially to the lung, the oesophagus, and the thyroid will then be calculated with PCXMC software.

Results: In all, 4500 children with catheterizations between 2000 and 2011 have been already included in the cohort, and recruitment is ongoing at the national level. The study is expected to finally include a total of 8000 children.

Conclusion: This French cohort study is specifically designed to provide further knowledge about the potential cancer risks associated with paediatric cardiac catheterization procedures. It will also provide new information on typical dose levels associated with these procedures in France. Finally, it should help improve awareness of the importance of radiation protection in these procedures.