THE COCCINNELLE STUDY-INTERVENTIONAL CARDIOLOGY DURING CHILDHOOD AND CANCER RISK

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Abstract

Interventional cardiology (IC) has become a necessary tool within the diagnosis and treatment of kids with a large style of congenital and purchased styles of disorder. Despite the clear clinical benefit to the patient, radiation exposure from IC could also be substantial. Given children's greater sensitivity to radiation and therefore the longer lifetime during which radiation health effects can develop, an epidemiological cohort study, named Coccinelle (French acronym for"Ladybird"), is distributed in France to guage the risks of leukaemia and solid cancers during this population. The study population consists of paediatric patients who underwent a minimum of one IC (either for diagnostic or therapeutic purposes) before the age of 16 years and from 1 January, 2000, through 31 December, 2015. Patients are recruited in paediatric cardiology departments that perform IC. Individual IC-related doses are being assessed for every child included within the cohort. for every IC performed, dosimetric parameters (dose area product, fluoroscopy time) are retrieved retrospectively. The cohort are followed up through linkage with French paediatric cancer registries. Our cohort study is specifically designed to produce further knowledge on the potential cancer risk related to paediatric IC. This research will increase our knowledge on the extent of doses received by the kids during IC and can provide additional radiation protection information.

Each year, approximately 6,500 to 8,000 children are born with a congenital heart defect (CHD) in France. These CHD are usually diagnosed and treated by interventional cardiology procedures (ICP). The use of those ICP ends up in an exposure to radiation (IR). because of the high sensitivity of youngsters and their long expectancy, which might result in the event of radiation-induced diseases like cancers, it's particularly important to assess the results of these medical irradiations during this young population. The aim of my thesis is to assess the chance of solid cancer and leukemia related to exposure to IR linked to ICP in childhood within the COCCINELLE cohort, a French cohort of 19,000 children, younger than 16 years, exposed to a minimum of one ICP between 2000 and 2013. the primary a part of the thesis was to perform a scientific review and meta-analysis on the danger of cancer after exposure to IR during medical diagnostic imaging procedures in childhood. Materials and methods: An electronic search was conducted within the electronic databases to hunt for all relevant published data using specific key words and full text. From the collected studies, hand-searched was done to retrieve studies from references. All English published relevant studies were included within the review and studies providing quantitative data were included within the meta-analysis. Random effects models are accustomed estimate pooled effects, using risk measurements reported within the primary papers. Results: a complete of 1674 articles are traced from different databases: PubMed/Medline (n= 318), Scopus (n= 199), web of Science (n= 399), base (n= 626), Global Health (n= 45) and from references (n= 87). After exclusion of duplicates (n= 181), 1493 articles are reviewed on the idea of their titles and abstracts. Among the chosen articles (n= 154), 123 of them are excluded (they didn't meet the inclusion criteria), and 31 were included within the review. Twenty of them were included within the chemical analysis. The studies focused in majority on CT scan, X-Ray and cardiac catheterization exposures.

In terms of events, leukemia, brain tumors and solid cancers were the foremost frequently studied outcomes. Conclusion: The study remains current and can give an summary of the risks related to medical diagnostic imaging procedures among children. The second a part of the thesis will assess the radiation induced risk within the Coccinelle cohort. Children treated with cardiac catheterization procedures have now a protracted expectancy and consequently potential long-term radiation-induced risks. We projected lifetime attributable risks (LARs) of cancer incidence from the foremost frequent procedures in pediatrics: atrial congenital heart defect closure, patent blood vessel occlusion, or pulmonary valvuloplasty. Organ equivalent doses were estimated for 1251 procedures performed in children aged ≤15 years at 2 reference catheterization centers in France from 2009 to 2013. Sex-specific LARs were projected in lifelong nonsmokers using extended Committee on Biological Effects of radiation VII risk models and considering various sources of risk projection uncertainties and dose variability (Radiation Risk Assessment Tool software). Median LARs ranged between 0.3 and 1.4 (atrial congenital heart defect closure), 0.6 and 5.0 (patent blood vessel occlusion), and 1.0 and 12.0 (pulmonary valvuloplasty) per 1000 procedures, looking on patient sex and age at treatment. These radiation-related risks would represent 0.4% to 6.0% of children's total lifetime cancer risk. For the ten of procedures (all types combined) with highest exposures, LARs reached 4.2 per 1000 (95% uncertainty interval, 0.8–13.1) in boys and 22.2 per 1000 (95% uncertainty interval, 7.4–45.6) in girls. In boys, carcinoma accounted for 70% to 80% of the projected

LARs, whereas in girls it accounted for 20% to 60% and carcinoma for 30% to 80% of the surplus risks, betting on the sort of procedure and patient age.Radiation exposure may result in substantial radiation doses and increased cancer risks in some cases. this implies the necessity for dose reporting to support recommendations for long-term surveillance and prevention strategies when it's necessary. Few studies estimated organ doses.

Despite advances in radiation protection, recent publications have reported surprisingly large doses, as represented by PKA and air kerma. there's little indication of a fall in these dose indicators over the last 15 years. neither is there much suggestion of a fall in doses related to the employment of flat panel detectors, as critical image intensifiers. An assessment of the impact of radiation dose within the context of overall patient outcome is required.