



Radiation Research

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Radiation Dose to the Brain and Subsequent Risk of Developing Brain Tumors in Pediatric Patients Undergoing Interventional Neuroradiology Procedures

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Radiation dose to the brain and subsequent lifetime risk of diagnosis of radiation-related brain tumors were estimated for pediatric patients undergoing intracranial embolization. Average dose to the whole brain was calculated using dosimetric data from the Radiation Doses in Interventional Radiology Study for 49 pediatric patients who underwent neuroradiological procedures, and lifetime risk of developing radiation-related brain tumors was estimated using published algorithms based on A-bomb survivor data. The distribution of absorbed dose within the brain can vary significantly depending on field size and movement during procedures. Depending on the exposure conditions and age of the patient, organ-averaged brain dose was estimated to vary from 6 to 1600 mGy. The lifetime risk of brain tumor diagnosis was estimated to be increased over the normal background rates (57 cases per 10,000) by 3 to 40% depending on the dose received, age at exposure, and gender. While significant uncertainties are associated with these estimates, we have quantified the range of possible dose and propagated the uncertainty to derive a credible range of estimated lifetime risk for each subject. Collimation and limiting fluoroscopy time and dose rate are the most effective means to minimize dose and risk of future induction of radiation-related tumors.

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