

Characteristics of Radiation-Induced Basal Cell Skin Cancer in Pediatric and Adult Hematopoietic Cell Transplant Recipients

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Previous analysis of second cancer development in human hematopoietic cell transplant patients had shown that total body irradiation selectively induced basal cell carcinoma but not squamous cell carcinoma or melanoma, that light skin color was a risk factor for basal cell carcinoma susceptibility, and that risks were higher in pediatric (<18 years) patients. In the present study, the analysis was expanded to consider (1) the effect of age at exposure on basal cell carcinoma induction and latency, (2) the effect of radiation on the age at which basal cell carcinoma is diagnosed, and (3) the effect of single acute exposures versus fractionated radiation exposures. Basal cell carcinoma developed at earlier ages following radiation exposure than after chemotherapy conditioning. Pediatric patients (< 18 years of age) were two-fold more sensitive to basal cell carcinoma induction than adult patients (18-45 years of age). Basal cell carcinoma latencies were inversely proportional to age, ranging from 15.7 ± 5.7 years in patients under 18 years to 5.2 ± 3.4 years in hematopoietic cell transplant patients over 45 years old when exposed. There was a 2.5-fold reduction in pediatric basal cell carcinoma rates when dose was fractionated. In contrast, fractionation had no effect on the dose-dependent basal cell carcinoma rate in adults. Dose dependent rates of basal cell carcinoma in the hematopoietic cell transplant patients were similar to those reported for other exposed populations (Figure 1). These results point to potentially different mechanisms of induction of basal cell carcinoma in pediatric versus adult exposed hematopoietic cell transplant patients.

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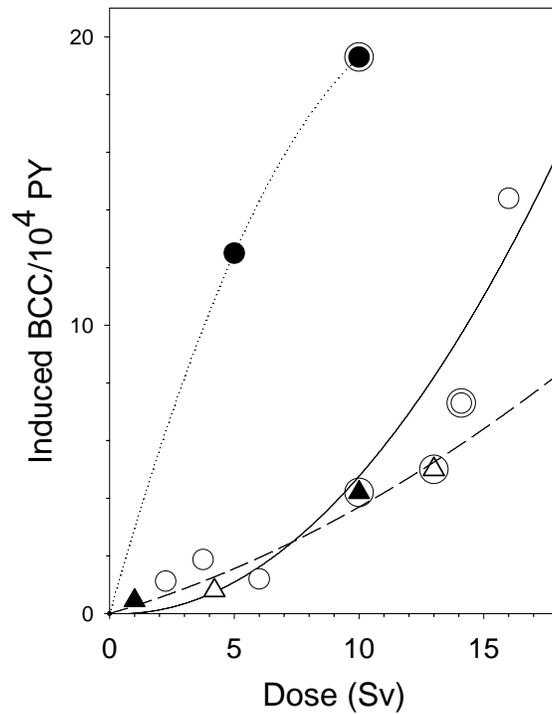


Figure 1. Dose-response for basal cell carcinoma (BCC) development in pediatric (O, ●) and adult (Δ, ▲) populations exposed to single (●, ▲) or fractionated (O, Δ) doses of radiation. HSCT population is indicated by a ring around data point. Adult populations are patients exposed when 18-45 years old. For this comparison, the mean reported exposure doses were used, and results were normalized to exposure of 3000 cm² of skin. Included are data from children exposed to radiation for the treatment of ringworm. In the Israeli study, exposures were fractionated and given each day over a 5-day period. In the New York study, fractions were delivered within minutes of each other and thus were considered acute.