Comparison of individual radiosensitivity of peripheral blood lymphocytes from prostate cancer patients and healthy donors

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Introduction: There is some evidence that approximately 10% of the population show an enhanced intrinsic radiosensitivity of normal tissue and hence have a higher risk for developing side-effects during or after radiotherapy. For that reason there is a need for a fast and robust test to assess normal tissue response to radiotherapy. DNA repair deficiency and altered apoptosis characteristics are discussed as promising markers of radiosensitivity. The aim of our study was to find out whether peripheral blood lymphocytes from cancer patients with strong clinical side effects following radiotherapy as assessed clinically on the basis of the EPIC questionnaire, show enhanced rates of in vitro radiation-induced double strand breaks (dsb), decreased DNA repair capacity and altered induction of apoptosis when compared to lymphocytes from patients without side effects and healthy age–matched donors. *Materials and methods:* The study included 20 prostate cancer patients without and 20 patients with acute side-effects during and after radiothrapy, as well as 20 healthy age-matched donors. From each donor, blood samples were collected, exposed to a radiation dose of 0.5 Gy or 1 Gy of γ –rays and analysed for the following biological endpoints: the initial level of dsb and the repair kinetics (γ–H2AX–assay), apoptosis (Annexin V/PI–assay) and the induction of chromatid–type chromosomal aberrations (G_2–assay). *Results:* Significant higher chromatid aberration yield was found between prostate cancer patients and healthy donors. Eleven patients which suffered because of acute side-effects after radiotherapy showed an enhanced aberration level. In addition, an elevated aberration level was observed also in 11 patients without side-effects after radiotherapy. No differences were observed between both patients group in any in vitro assay. Based on the results of all chosen assays 6 prostate cancer patients were identified as cellular sensitive, whereof 4 of them were also clinical sensitive.