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 (PBLs) from cancer patients with strong clinical side effects following radiotherapy as assessed clinically on the basis of the RTOG/EORTC scale, 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 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). Additionally FISH analysis (G_0-aberrations) were performed for some patients of each group. *Results:* The maximum number of γ–H2AX foci occurred at 30 min after exposure without significant differences in numbers of foci between both groups of patients and healthy donors. The frequency of spontaneous and radiation-induced apoptoses was determined 30 min, 5 h and 24 h post-irradiation and showed a significant increase of early apoptosis 24 h post-irradiation for both patients and healthy donors. The rate of necrosis had a tendency to increase 24 h post-irradiation in patients with strong clinical side effects. The highest level of aberrations was observed for patients with strong clinical side effects in comparison to patients without any side effects and healthy donors.