Delayed Immunological Effects of the Acute Radiation Syndrome

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Objective. From 237 cases of ARS registered after Chornobyl 134 diagnoses were confirmed. The rest of 103 exposed were regarded as non-confirmed ARS (ARS-0) due to the absence of supportive diagnostic materials or other reasons. Long-term follow-up was performed of 192 survivors who are citizens of Ukraine. Methods. Delayed immunologic effects were studied in 57 ARS grade 0-III survivors 20 years after exposure. Cellular immunity was studied by peripheral blood mononuclear cells and early progenitors subset analysis, p53, bcl2, Bax, CD95 expression, spontaneous and verapamil-induced apoptosis, proliferation tests with Con A, microbial and tissue antigens; oxidative status was studied by MDA, catalase, SOD, β-glucosidase, β-galactosidase activity, antioxidant factor, lipid peroxidation, GSH and ceruloplasmin concentration. Results. Combined radiation induced immune deficiency was demonstrated as the early changes with a period of recovery of 7 to 20 years depending of the exposure dose. In ARS-0 and 1 wavy variations of basic immunity parameters were shown with the tendency to normalization. In ARS-1 and 2 (group doses: 1,34; 1,75 Sv) we registered normal mean parameters of T- and B-cell subsets and oxidative status except of ceruloplasmin. Low expression was shown for CD123w antigen. Immune function deviations were demonstrated in activation tests and induced apoptosis. In ARS-3 (mean dose: 5,6 Sv) a marked immune system deficiency was demonstrated at the group levels (low CD4+, NK-cell counts, high CD8+ with significantly smaller cytotoxic T-cell subset) accompanied with low oxidative stress markers and significantly higher MDA and GSH. Analysis of confounding factors such as endocrine and nervous systems influence and blood viral infections carriage showed a prevalent role of the radiation exposurel a marked dose-effect dependency remained at the late period at individual and group levels. Number of TCR-variant cells correlated with the decreased immune function. Radiation-induced depression of immunity was characterized by the non-stability of CD34+ cells with presence of committed primitive early progenitors not capable for terminal differentiation and apoptosis. High proliferative activity and accumulation of CD34+ cells as an adaptive reaction to radiation exposure in combination with the decreased apoptosis, cytotoxic and NK-cell activity could be the basis for radiation-induced oncologic effects.

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