

A rapid method for the evaluation and the triage of mass radiation casualty victims

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An iridium source (initial activity of 3.6 TBq) from an industrial radiation device was accidentally stored for 8 weeks near a workplace in Dakar (Senegal) in 2006. This resulted in a protracted irradiation with a variable dose rate of 63 potential victims, among which 4 presented radiological burns. A main concern was then to identify potential victims at risk to develop an acute radiation syndrome. However, due to the duration and delayed recognition of the accident, the initial decrease in lymphocyte numbers and the intensity of the prodromal syndrome were not available. We then used two parameters easily available, namely blood formula and plasma Flt3 ligand (FL) concentration. Twenty-seven percent of patients showed a mild leucopenia, of which one patient showed a severe leucopenia (WBC below 1×10^9 /l of blood). Two patients showed a severe lymphopenia (lymphocytes below 0.5×10^9 /l of blood). A mild neutropenia was detected in 27 patients (42.9%) and a severe neutropenia in one patient. Thirty-one patients (49.2%) showed a mild thrombopenia, of which 5 patients showed a severe thrombopenia (platelets below 50×10^9 /l of blood). FL concentration was higher than the normal range of an African population in 11 patients. Among those patients, only one patient showed a FL concentration in the range of a severe bone marrow aplasia. In order to facilitate the interpretation of these data, we set up a score based upon these parameters. A score of 0 was attributed for each patient having a number of WBC in the normal range, a score of 1 to patients with WBC below the normal range but above the severe leucopenia level, and a score of 2 to patients in the severe leucopenia range. This scoring was repeated for neutrophils, lymphocytes, platelets, RBC and FL concentration. As a result, one patient had a score of 11, two patients had a score of 5, and 9 patients had a score of 3 or 4. These score were then compared to the results of biological dosimetry. This indicated that a good correlation was obtained between the score and the radiation dose received. This method of scoring may be useful for the initial triage of potential victims, especially in situation of protracted irradiation or delayed recognition. However, this method does not substitute to the cytogenetic determination of the radiation dose or to the evaluation of radiation-induced damages to the organs and tissues.