The influence of x-ray contrast agents in computed tomography on the induction of dicentrics and gamma-H2AX foci in lymphocytes of human blood samples.

The aim of this study was to investigate and quantify two biomarkers for radiation exposure (dicentrics and gamma-H2AX foci) in human lymphocytes after CT scans in the presence of an iodinated contrast agent. Blood samples from a healthy donor were exposed to CT scans in the absence or presence of iotrolan 300 at iodine concentrations of 5 or 50 mg ml\(^{-1}\) blood. The samples were exposed to 0.025, 0.05, 0.1 and 1 Gy in a tissue equivalent body phantom. Chromosome aberration scoring and automated microscopic analysis of gamma-H2AX foci were performed in parts of the same samples. The theoretical physical dose enhancement factor (DEF) was calculated on the basis of the mass energy-absorption coefficients of iodine and blood and the photon energy spectrum of the CT tube. No significant differences in the yields of dicentrics and gamma-H2AX foci were observed in the absence or presence of 5 mg iodine ml\(^{-1}\) blood up to 0.1 Gy, whereas at 1 Gy the yields were elevated for both biomarkers. At an iodine concentration of 50 mg ml\(^{-1}\) blood serving as a positive control, a biological DEF of 9.5 \(\pm\) 1.4 and 2.3 \(\pm\) 0.5 was determined for dicentrics and gamma-H2AX foci, respectively. A physical DEF of 1.56 and 6.30 was calculated for 5 and 50 mg iodine ml\(^{-1}\), respectively. Thus, it can be concluded that in the diagnostic dose...
range (radiation and contrast dose), no relevant biological dose-enhancing effect could be detected, whereas a clear biological dose-enhancing effect could be found for a contrast dose well outside the diagnostic CT range for the complete radiation dose range with both methods.