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FISH analysis of chromosome damage in whole blood as indicators of late radiation toxicity after radical radiotherapy in prostate cancer

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Whole chromosome fluorescence in situ hybridization (FISH) allows for the detection and identification of chromosome translocations in metaphase spreads. Previous research has shown that radiation induced translocations correlate with both acute and late effects after radiotherapy [1]. This study has examined the incidence of translocations, after exposure to in vitro radiation, in both normally responding patients (pts) and those exhibiting late effects after radiotherapy treatment to evaluate FISH as a method for predicting radiosensitivity. Patients were selected from a randomized trial evaluating the optimal timing of Dose Escalated Radiation (76 Gy) and short course Androgen Deprivation Therapy for intermediate-risk prostate cancer. In the first 350 pts entered on trial with mature follow-up (mean 78 months), 3% developed grade 3 late proctitis. Blood samples were taken from this radiosensitive cohort (10 pts) along with matched control pts (20 pts) with no late proctitis. Whole blood samples were exposed to 0 or 4 Gy and cultured according to the IAEA recommended methods. Staining was carried out according to the standard protocol provided by the manufacturer of the probes (Cytocell 1,2,4 Direct Probe). At least a 1000 metaphase spreads, or up to 100 translocations per sample were scored according to the PAINT system.
While both groups were statistically similar at 0 Gy, preliminary results indicate that after an in vitro dose of 4 Gy, the radiosensitive group had significantly higher rates of translocations (average=2.51, SD=0.36) compared to the control group (average=1.89, SD=0.23) ($p<0.002$). Further statistical analysis will investigate different types of damage including differentiating between stable and unstable damage.
These results confirm previous studies and indicate that the analysis of translocations using FISH after in vitro irradiation correlates with clinical response to radiation. This cytogenetic assay should be considered as a predictor of radiosensitivity.

Reference

[1] S. Neubauer, J. Dunst, and E. Gebhart, ``The impact of complex chromosomal rearrangements on the dete

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