The significance of ICG-R15 in predicting hepatic toxicity in patients receiving radiotherapy for hepatocellular carcinoma

Background/aim: The purpose of this study was to evaluate whether the retention rate of indocyanine green at 15 minutes following administration (ICG-R15) could predict radiation-induced hepatic toxicity (RIHT) in patients treated with radiotherapy (RT) for hepatocellular carcinoma (HCC).

Methods: We retrospectively reviewed data from 309 HCC patients treated with RT between February, 1992 and December, 2007. The ICG-R15 was measured within 2 weeks prior to the start of RT. We analyzed the correlation between the incidence rate of RIHT and the ICG-R15 before RT (pre-RT ICG-R15).

Results: Acute grade 3 or 4 toxicity of T.bil, ALP, AST, and ALT were shown in 28 patients (9.1%), 2 patients (0.7%), 43 patients (13.9%), 20 patients (6.4%), respectively. Chronic grade 3 or 4 toxicity of T.bil were reported in 53 patients (19.3%). 5 patients (1.8%) presented grade 3 or 4 chronic toxicity of ALP. Grade 3 or 4 late toxicity of AST and ALT were observed in 49 patients (17.8%) and 13 patients (4.7%). Therefore, RIHT was occurred in total 118 patients (38.2%). On univariate analysis, incidence rates of RIHT for the patients with higher than 30% of pre-RT ICG-R15 was 58.1 % compared with 35 % for levels lower than 30% (p=0.004), which was most powerful cutoff level of pre-RT ICG-R15. There was no significant clinical factor affecting RIHT on univariate analysis. However, dose prescription guideline of Yonsei University and administration of post-RT chemotherapy were used for multivariate analysis since they showed borderline significance in the incidence of RIHT (p=0.062). On multivariate analysis, pre-RT ICG-R15 was the only significant factor affecting RIHT (p=0.009).

Conclusion: These results suggest that pre-RT ICG-R15 is the most useful factor in predicting RIHT in HCC patients treated with RT. A greater than 30% of pre-RT ICG-R15 value is significantly correlated with severe hepatic toxicity following RT in HCC patients. Therefore, the pre-RT ICG-R15 value could serve as a RT indication parameter in the RT guidelines for HCC.