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For critical structures the use of maximum or mean dose limits in the intensity modulated radiation therapy (IMRT) optimization is not very meaningful. The dose-volume limits and equivalent uniform dose (EUD) which is defined as the uniform dose that would lead to the same effect as the given non-uniform dose in as particular organ are combined to analyze the volume effect. The normal tissue complication probability (NTCP) is a predictor of radiobiological effect for organs at risk (OAR). The calculation of the NTCP is based on the DVH which is generated by the treatment planning system after calculation of the 3D dose distribution. Uniform EUD irradiation of an OAR results in the same NTCP as the original non-homogeneous distribution. The NTCP equation is therefore represented as a function of EUD. The inverse equation expresses EUD as a function of NTCP.

Expressing NTCP in terms of EUD represents a step toward simplifying the conceptual framework for modeling probability of expected complications. The aim of this study is to compare radiobiological effects between the fif IMRT and inverse IMRT for treatment of Glioblastoma (GBM) using the equivalent uniform dose (EUD) and normal tissue complication probability (NTCP). Five representative patients treated with definitive radiation using IMRT at our clinic in the last two year were selected for treatment planning study. Criteria for inclusion were glioblastoma. The normal tissues (Organ at Risk, OaR) contoured included brain-stem, optic chiasm, optic nerves, right-left cochlea and whole brain. Brain was defined as total brain tissue minus the PTV. Two different radiation therapy techniques; inverse IMRT and Fif IMRT treatment plans were optimised with the prescription dose 60 Gy/30 fractions. All those calculations and IMRT optimizations were performed using the Prowess Panther DAQ TPS with 6 MV, Siemens Artiste, MLC with 160 leaves and evaluated by using EUD and NTCP models. In the present study, target dose coverage was improved with inverse IMRT planning as compared with fif IMRT planning. With respect to NTCP there is no significant differences between fif IMRT planning and inverse IMRT planning. For the optic chiasm, brainstem, right-left eyes and right-left lens the NTCP values were calculated to be smaller than %1 for both IMRT plannings, except for GBM3 patient as a result of eye(L) concurrent with PTV. So the maximum NTCP was 1 for lens(L) of GBM3 patient for both plannings. Eye(L) of NTCP values were 0.15479 and 0.10896 respectively for this patient with a frontosfenoidal tumor and a biggest size of tumor, 8.82 cm. After obtaining these results we decided to compare also the total monitor units (MU) of optimizations. Then, we find that total MU value of the fif IMRT plannings are smaller than inverse IMRT plannings. So, the fif IMRT planning can be chosen for short treatment time and comfort of the patients for GBM patients treatment.