Analysis of NTCP Based Radiobiological Models: A Systematic Review of Literatures

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ABSTRACT

Introduction: To achieve the optimal treatment goal, radiobiological parameters has to evaluate and predict the outcome of this treatment plan in terms of both TCP and NTCP. Different types of radiobiological model were used to achieve prescribed treatment dose of radiation during the tumor control. Where TCP models play a important role in order to achieve desired dose to the tumor. A suitable NTCP model was theoretically found among different models that can be used in treatment plan evaluation.

Methods: Theoretically, Six different radiobiological dose response models were analyzed in this project. Lyman–Kutcher–Burman, Critical element, critical volume, Relative Seriality, Parallel architecture, Weibull distribution models were analyzed from the derivation. All models were discussed elaborately with its various parameters and were used in the calculation of normal tissue complication probability during the treatment in radiotherapy. Further, all models were compared with each other.

Results: The models denote the dose for 50% complication probability (D50) parameters is the most commonly used radiobiological models for the normal tissues. The functional subunit response models (critical element & Relative seriality, Critical Volume, parallel architecture) are used in the derivation of the formulae for the normal tissue.

Since all complicated NTCP model predict same as the simple NTCP model that is Lyman–Kutcher–Burman model as well as it is computationally efficient. Also Lyman–Kutcher–Burman model can be used in different treatment planning system incorporating with other model. For this reason our suggested model is Lyman–Kutcher–Burman NTCP model which can be used in treatment plan evaluation.

Conclusion: After analyzing six different model of NTCP, Finding of the study is the treatment plan evaluation in where Lyman–Kutcher–Burman model is the best model for biological plan evaluation.

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