

Purpose: To develop the biological and dosimetric based tools for the evaluation of the treatment plans.

Methods and Materials: We have developed a set of treatment planning evaluation tools based on the equivalent uniform dose(EUD), Coverage Index(CI), Homogeneity Index(HI) and Overdose Index(OI) to evaluate the HDR brachytherapy treatment plans. Three different optimization techniques in PLATO treatment planning system are used for CT based 3D conformal brachytherapy: geometric optimization(GO), inverse optimization(IO), and the optimization to the dose points on the surface of the tumor volume(SO). All reference doses are prescribed to the points on the PTV surfaces. Treatment plans of 10 patients are analyzed.

Results: The GO techniques has the best dose uniformity(mean HI=0.60) but poorest target volume coverage(mean CI=0.71). The SO method provides the best coverage(mean CI=0.85) and lowest homogeneity(mean HI=0.62). The IO plans show a compromise between coverage and dose homogeneity(mean CI=0.52 and HI=0.43). CI and EUD show close correlation for plans produced by all three optimization techniques.

Conclusion: Our study suggests that these dosimetric indices could be useful tools in the evaluation of the CT based 3D conformal brachytherapy planning.