

AbstractID: 1824 Title: Evaluation of MammoSite Radiation Treatment Plans for Breast Cancer Using both Biological and Physical Indices

We have developed a set of treatment planning evaluation tools based on both biological indices (EUD and TCP) and physical indices Coverage Index(CI), Homogeneity Index(HI) and Overdose Index(OI) to evaluate the MammoSite balloon treatments delivered to patients with breast cancer. Three different treatment techniques are studied: a single source dwell position irradiation, a multiple source dwell positions with the six prescribed dose points placed on the equator and two poles of the balloon, and a multiple source dwell positions determined by surface optimization. Treatment plans of 15 patients are analyzed. Both EUD and TCP are based on biological L-Q model. Lyman's NTCP model is used with the EUD for the inhomogeneous dose distribution. Other dosimetric indices (CI,HI,OI) are employed to analyze the dose volume distribution. Our study shows that both surface optimized and six points plans provide better dose coverage than that single point plans with surface optimized plan slightly superior to six points and TCP ($\alpha=0.51, \alpha/\beta=0.836$, clonogenic cells number= 8×10^4).

	EUD _{ptv} (Gy)	TCP	CI _{ptv}	HI _{ptv}	OI _{ptv}	EUD _{oar} (Gy)	NTCP
Surface	34.37	0.98	0.93	0.58	0.08	29.27	0.00
Single	31.55	0.95	0.87	0.58	0.05	28.05	0.00
6 points	33.75	0.98	0.92	0.57	0.08	29.85	0.00

HIs for the PTV remain very consistent for all three treatment techniques. We found no significant skin complication probability for late responding patients, following Lyman parameter values $n=0.10$, $m=0.12$ and $TD_{50/5}=70\text{Gy}/100\text{cm}^2$. Our study suggests that EUD and TCP could be useful tools in evaluation of the MammoSite breast brachytherapy treatment along with other carefully designed dosimetric indices.