

AbstractID: 2056 Title: Comparison of Two Inverse IMRT Treatment Planning Systems

Inverse IMRT treatment plans produced by the Memorial (MSK) and BrainLab (BL) planning systems were compared. Identical CT scans, tissue contours, and beam directions were input to both programs. Plans for tumors in the brain, nasopharynx, and paraspinal region with PTV's from 9 to 507 cc were compared. The planning systems have different optimization strategies, cost functions, intensity iteration algorithms, and schema for specification of optimization constraints and penalties. BL favors plans with more penumbra sharpening as compared to MSK. Moreover, BL optimizes the PTV first, then the normal tissues. MSK considers all structures simultaneously. MSK uses conjugate gradient minimization, fixed penalties, and a cost function based on quadratic dose differences. BL uses a maximum likelihood minimization, dynamically changing penalties and a cost function based on the logarithm of dose ratios. Specification of dose, dose-volume constraints and penalties are also different. Despite these differences the two systems produce similar dose distributions albeit with markedly different intensity patterns. PTV D_{95} 's and normal tissue D_{05} 's are similar for plans generated by both systems although mean doses to normal tissues and total monitor units are lower with BL. When PTV and normal tissues overlap MSK system produces lower normal tissue D_{05} 's but BL produces better PTV coverage. This suggests that for most treatment plans markedly different optimization algorithms, cost functions, and even resulting intensity profiles can all satisfy the same tissue dose constraints. In the parlance of 'optimization space' there is a broad valley of acceptability rather than a deep global minimum.

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