AbstractID: 1982 Title: A Method for the Direct Use of Biological Imaging Data in Inverse Planning Objectives

The use of biological imaging data in radiation treatment planning is currently rare, yet in the near future it may revolutionize the way we plan. Biological imaging data (*e.g.,* magnetic resonance spectroscopy - MRS, functional magnetic resonance imaging - fMRI) provide information beyond that available through computed tomography or magnetic resonance imaging, allowing us to locate and quantify cellular processes relevant to cancer treatment. In regions of relative biological activity or inactivity, increasing dose to targets or decreasing dose to normal anatomy may improve local control or decrease morbidity.

Other researchers have used hand-contoured biological data in inverse planning. In contrast, we incorporate uncontoured biological data directly into inverse planning objectives. This obviates the subjective and labor-intensive contouring process and enables finer and less subjective control of dose goals. As in other approaches, biological data is registered to anatomic data. However, in our approach, we use novel tools to identify meaningful regions of activity and calibrate the biological data. The calibration process creates a dose modulation map that is used during optimization to modulate the individual dose goals of specific treatment objectives. Dose modulation has been incorporated into minimum, maximum, dose-volume, and biological objectives. With more precise dose modulation, setup errors and patient movement are more of an issue than in conventional inverse planning. We demonstrate the use of the method for improved dose targeting and conformal dose avoidance using minimum and maximum dose objectives in a brain case.

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