

AbstractID: 1173 Title: A sensitivity guided algorithm to automated determination of objective function parameters for IMRT

The goal of this investigation is to develop the methods to automated determination of the optimum objective function parameters without resorting to trial-and-error. We have developed a “sensitivity-guided” method for automated determination of optimum objective function parameters. Our method is based on the theorem that, in a globally optimal plan, if we attempt to improve the score of one of the structures, we must sacrifice the score of at least one other structure. However, different structures have scores with different sensitivity. Therefore, we should be able to improve the sub-score of the most important structure with selective degradation of the scores of the highest sensitivity structures. Similarly, we should be able to greatly improve to the scores of the lowest sensitivity structures while minimally compromising the score of the most important structure. For a lung cancer case, we demonstrated that IMRT plans may be designed that favor an anatomic structure of choice which has highest sensitivity and the sparing of the structures with least sensitive scores may be improved without compromising the target coverage. We also demonstrated that several alternative optimum solutions can be designed each favoring a different anatomic structure. We applied our methods to eight oropharyngeal cases to obtain the objective function parameters that automatically satisfy the requirements of the RTOG-H-0022 protocol. All eight computer-generated objective function parameters optimized plans met the RTOG criteria with no variations or minor variations. Similar plans could be obtained with manual adjustment of parameters but with considerable time and effort.