AbstractID: 78 Title: Beam angle optimization and reduction for IMRT of thoracic cancers

IMRT often involves use of many beam angles, typically equal-spaced or selected manually by planners. Whether such beam arrangements are appropriate for irradiating thoracic tumors, and whether fewer beams can be used to improve efficiency of treatment delivery are unanswered questions. In this work, we investigated the possibility and methodology of optimizing and reducing beam angles for IMRT of lung and esophageal tumors. Beam angle optimization (BAO) method used was based on an exhaustive search scheme which evaluates IMRT plans for all possible beam configurations, for example, 5 out of 17 coplanar beams spaced about 21 degree apart. The best beam angles were chosen based on values of the objective functions for IMRT optimization. Because results of BAO depend on parameters of such objective functions (e.g., dose-volume constraints and their weighting factors), a method was further developed to determine suitable parameters for BAO. To investigate the effect of fluence modulation on BAO, we also performed and compared BAO results for two types of treatments, using either none-modulated 3D conformal beams, or IMRT beams. Results showed that IMRT plans using 5 and 7 optimized angles could achieve essentially identical plan quality as those of using 9 equal-spaced beams. It is also possible to accelerate the speed of the BAO by using fewer beams or with none-modulated beams, which had similar BAO results with those of using more beams with full-scaled fluence modulation.