AbstractID: 14178 Title: Beam angle optimization for IMRT plans

Purpose: Selecting good beam orientations is an important step in the IMRT planning process that is usually completed by the planner based on their experience. In this study, we proposed a method for determining the minimum number of beams needed and the beam orientation for IMRT plans.

Materials and Methods: The beam angle selection begins with a search of the best "one-beam" plan. For this purpose, 36 single-beam plans with the beam gantry angle from 0° to 350° every 10° degrees were optimized using Prowess Panther TPS. The two beam orientations with lowest dose to OARs and satisfying the plan constraints are selected. The next step, which applies for the remainder of selected beam orientations applies a different criterion – a beam orientation is selected if it maximizes the conformality index while keeping the OARs does within tolerance. For example, for the third beam orientation, thirty-four "three beam" plans in which two fixed beams are from previous step and third beam's gantry varying from 0° to 350° and not at the same beam angles previously selected was optimized. This step was repeated for next beam until the plan achieved a reasonable conformity.

Results: It takes about 2h to running beam angle optimization. For the selected brain case, it has been shown that our selected 5 beam plan results in a better target conformity, 0.81 compared to 0.76, with similar OARs doses compared to 7 equispaced beam plans. Both of these plans satisfy dose constraints for OARs.

Conclusions: We concluded that using fewer, well placed beams than equispaced beam has capacity of achieving as good plans in term of conformity and dose to OARs. This will enable a fully automatic IMRT planning process without going through a time consuming trial and error beam selection process.