

Since the introduction of IMRT, most planners would advocate that a coplanar beam arrangement is adequate for obtaining a very conformal dose distribution. At the same time, there are many clinical cases in which a careful selection of incident beam directions can make a significant difference in the final dose distribution, for the target as well as the organs at risk. Non-coplanar beams provide an additional degree of freedom for IMRT treatment optimization and in some complex cases can yield superior plans.

The purpose of this work is to compare (i) a conventional nine beam coplanar IMRT plan, with a (ii) user selected non-coplanar IMRT geometry and (iii) an optimizer selected beam geometry technique. The three plans are then compared by means of isodose distribution, DVH, and ROI dose statistics. All plans used nine photon beams. The selection of the beams for the non-coplanar orientation is made based on user's best judgment for beam placement. In the case of the optimizer, it picks 9 from 51 beam-couch arrangements that are clinically deliverable based on maximum beam weight contribution to meet the clinical objectives.

This methodology has been applied to clinical cases using the Pinnacle treatment planning system. The coplanar plans produce very satisfactory distributions for targets with cylindrical symmetry in the caudal-cephalad axis. For the brain tumors that we studied that are more geometrically complex and are proximal to critical structures, the non coplanar and optimizer picked IMRT beams yielded improved plans, especially in terms of dose avoidance to organs at risk.