

AbstractID: 3580 Title: Effect of number of beams on dose gradients and quality of IMRT plans

**Purpose:** To investigate the dose gradient as a function of number of beams and the role of beam angle selection in IMRT plans

**Method and Materials:** A hypothetical tumor and an organ-at-risk (OAR) were created in a cylindrical phantom, with two different tumor-OAR distances: 3mm and 7mm. For each tumor-OAR arrangement, 22 plans with different beam configurations were generated using 3, 4, 6, 9 and 15 equally spaced beam angles. 6 additional plans were created for the beam number of 3, 4 and 6 using selected beam directions based on tumor-OAR geometry. All plans were compared based on the same dose coverage to the tumor, the plan conformal index, dose gradient (defined by the minimum distance between the 90% and 20% of iso-dose lines), maximum dose and mean dose to the OAR.

**Results:** The dose gradient is linearly broadened as the number of beams is increased. The plan conformal index is rapidly improved from 3 to 6 beam angles. The maximum dose (defined as  $D_{1\%}$ ) to the OAR is linearly decreased as the number of beams is increased while the mean dose to the OAR is decreased only from 3 to 9 beam angles. When compared to the equally spaced beam directions for a given number of beam angles, the selected beam angles can only improve the mean dose to the OAR.

**Conclusion:** Using more beams in IMRT plans can improve plan conformality and reduce maximum dose and mean dose to the OAR, but it may broaden the dose gradient, which is defined as a minimum distance from 90% to 20% isodose lines. The tumor-OAR geometry is not a good indicator for beam angle selection in IMRT planning.

**Conflict of Interest (only if applicable):**

Research is supported in part by Prowess Inc.