

AbstractID: 13578 Title: New measures for evaluating SBRT dose distribution quality.

Purpose. To define a measure that indicates how well the dose distribution in SBRT treatment satisfies standards of dose symmetry and compactness required by SBRT RTOG protocols.

Method. Any SBRT dose has to provide the adequate coverage of the PTV and away from PTV it has to decrease fast enough to minimize the volume of tissue in the organ in which the tumor is contained (e.g. lung, liver) (see RTOG 0236). To measure the tightness of dose around PTV one may create a sequence of regions that increase their detachment from PTV quantifying the dose in subsequent regions away from the target. The convenient approach is to build histograms based on a sequence of shells that wrap the target one after the other. This can be achieved by creating sequence of shell structures in the TPS system (script in case of Pinnacle) for which values of minimal, maximal and average dose will be automatically assigned and displayed in the form of appropriate histogram.

Results. The script has been written for Pinnacle 8.0m and examples of dose distributions for sequence of SBRT plans have been analyzed by means of computed for these plans histograms. Histograms provide natural means for verification of SBRT RTOG parameters denoted as R_{50} and D_{2cm} . These histograms provide, however, also additional information on symmetry and steepness of dose gradient in SBRT dose distributions.

Conclusion. As in SBRT the quality of treatment depends on the location relative to the target of volumes of tissue exposed to given dose levels measures that go beyond DVH and quantify spatial properties of dose distribution in tissue are needed for the assessment of SBRT treatment quality.