

## AbstractID: 10491 Title: Spatial Dose-Volume Histogram (sDVH) - Incorporating spatial dose information back into the DVH

**Purpose:** To incorporate spatial information into dose-volume histograms (DVH).

**Methods and materials:** For clinical prostate and head/neck cases, initial plans were created using dose-volume constraints for planning target volume (PTV) and organs at risk in the Eclipse treatment planning system. Dicom RT files were exported to in-house Matlab-based software which categorizes target dose voxels by their location within the PTV. For this study, we arbitrarily chose three regions: center, middle, and periphery. Spatial dose-volume histograms (sDVH) were created by color-coding the three regions within the differential DVH. Spatially optimized plans were then created using the sDVH concept to preferentially push cold spots from the target center to the periphery.

**Results:** For both prostate and head/neck cases, the DVH and dose distributions are different for the two plans. Using DVH only, the initial plan appears more homogeneous than the spatially optimized plan, however, inspection of the dose distribution reveals that the spatially optimized plan may be clinically favorable since there is less underdosing in the center of the target. The more homogeneous initial plan has a sharper peak in the sDVH. However, it also leaves a significantly larger fraction of the center region underdosed in comparison to the spatially optimized plan (5% vs 0.5% for prostate; 11% vs 3% for head/neck).

**Conclusion:** Treatment plan evaluation based on DVH analysis alone excludes spatial information about the dose distribution. Plans with superior DVHs might be clinically inferior once spatial dose information is considered. The sDVH is a very simple and intuitive way to incorporate spatial dose information back into the DVH format. The sDVH provides more information than DVH alone and may be more consistent with dose distribution analysis for plan ranking purposes, thus making it a useful tool for plan quality evaluation and optimization.

**Conflict of interest:** Supported by Varian Medical Systems.