

AbstractID: 11579 Title: The influence of CT resolution on volume definition and image quality in SRS and SBRT simulation

**Purpose:** To determine the influence of resolution of the CT scan (including sub-millimeter slice thickness) on volume definition and image quality in stereotactic radiotherapy and body radiotherapy simulation.

**Method and Materials:** A novel low-contrast gel phantom was fabricated with spiculated tumor-like volumes approximately 2, 5, 8, and 20cc in size. The phantom was scanned using a Philips Brilliance BigBore 16-slice CT scanner. First, a scan was taken using our standard clinical protocol employing a 16x1.5mm collimator and reconstructed slice thickness of 3mm. Next, a scan was taken with the sub-millimeter collimator (16x0.75mm) and reconstructed with slice thicknesses of 0.75mm and 3mm for comparison. Contours of the structures were drawn using a specific CT number range in Eclipse. Digitally reconstructed radiographs (DRRs) were exported for evaluating image quality and the standard deviation (SD) was calculated for four uniform, non-background regions.

**Results:** The difference in measured volume decreased with increasing tumor size when comparing the standard clinical scan and both sub-millimeter scans. Measured volume varied from 4-16% for volumes less than 10cc when comparing the 0.75mm and clinical scan. The 3mm reconstructed sub-millimeter scan showed smaller but significant volume differences (>5%). The 16x0.75mm scan increased the CTDI dose by 9.4% versus the clinical protocol scan. Small spicules in the tumors resulted in greater measured volume in the 0.75mm scan. These features were easier to visualize in the 0.75mm DRR, however, SD values were larger than both 3mm scans (15-69%).

**Conclusion:** Tumor size and shape are important considerations in choosing slice thickness for stereotactic radiotherapy simulation. As expected, slice thickness has larger effects on smaller targets. DRR feature sensitivity improved with the 0.75mm scan, but an increase in noise was observed. Our results show that sub-millimeter slice thickness is useful in SRT for smaller target volumes despite a small increase in patient dose.