AbstractID: 9653 Title: Evaluation of cine-CT for quantifying respiratory displacement of lung tumors without a respiratory surrogate

Purpose: The conventional approach to measuring tumor **displacement**, the net movement of its geometric center, is to use 4D-CT with a respiratory surrogate. We propose using the MIP, average CT and new Max-Min projection CT images from cine-CT without a respiratory surrogate as a method of evaluating respiratory displacement of lung tumors. We evaluate the reliability of this method in producing accurate displacement quantification. **Methods and Materials:** We design a new Max-Min projection CT image, which is the pixel-by-pixel average of the maximum intensity projection (MIP) and minimum intensity projection (mip.) The Max-Min directly shows the displacement volume of a tumor. A simple distance measurement on Max-Min yields the tumor displacement. Max-Min, cine-MIP and cine-ACT are obtained on a scanner with the cine-CT capability without using a respiratory surrogate. The average CT (ACT) images are derived from averaging the cine CT images at the same slice location. All cine-CT images are acquired on a GE 8-slice CT. We use Max-Min, cine-MIP and cine-ACT images to measure the tumor displacement for 38 4D-CT simulation patients with lung tumors. For comparison, the 4D-CT scan of each patient is also used to measure displacement. **Results:** The Max-Min images show a clear displacement volume and yield a measurable displacement in 76.3% of cases. The Max-Min method works best for tumors with reasonably smooth boundaries and displacements less than the tumor size. With 4D-CT as a gold standard, Max-Min measures displacement accurately to within one CT voxel (2.5 mm). In the other 23.7% of cases, cine-MIP and cine-ACT are used to quantify the displacement with 5 mm accuracy (2 CT voxels). **Conclusion:** Use of the Max-Min, cine-MIP and cine-ACT images is a reliable method of quickly quantifying tumor respiratory displacement without a respiratory surrogate.