

AbstractID: 4565 Title: Use of Minimum Intensity Projection for Target Volume Delineation in 4D-CT using Contrast for Liver Cancer

Purpose:

To investigate the use of the minimum intensity projection (minIP) methodology for the accurate and rapid generation of internal target volumes (ITVs) in four-dimensional CT (4D-CT) scans using IV contrast for Liver Cancer. Single (4D-CT) scans reliably capture intra-fractional tumor mobility for radiotherapy planning, but generating the ITVs requires the contouring of gross tumor volumes (GTVs) in up to 10 respiratory phases. The use of maximum intensity projection (MIP) protocols for the generation of ITVs in Lung has been recently shown to be reliable, but cannot be used for Liver due to the use of contrast agents.

Method and Materials:

We obtained the 10-phase ITVs using the 4D-CT data sets contoured by one physician using Pinnacle. The ITVs generated from the minIP volume data sets were determined by automatic contouring. Comparison of the ITVs was performed by focusing on the tumor volumes and voxel positions.

Results:

The results showed that the differences in the tumor volumes were slight in the lower lobe of the liver. In the upper lobe of the liver, however, we observed a significant difference in tumor volumes between the ITVs. This is because the minIP algorithm systematically chooses the lowest CT value in each 10-phase voxel set, which leads to a preferential selection of lung tissue over liver tissue in the diaphragm region. In the lower lobe of the liver, the tissue is basically liver or tumor, and so tissue selection should generally not be as complex.

Conclusion:

The minIP algorithm has not been shown to be robust for the delineation of liver tumors located near the top of the diaphragm. In the rare occasion where there is bowel including gas is located near the liver tumor, we predict the minIP may also be inadequate for the tumor delineation.