

AbstractID: 3485 Title: Dynamic contrast enhanced CT to improve localization of the GTV within the prostate

Purpose:

To achieve a higher sensitivity and specificity in the localization of the GTV within the prostate using quantitative perfusion maps obtained from dynamic contrast enhanced CT (DCE-CT) imaging.

Method and Materials:

DCE-CT tracks the passage of a bolus of contrast agent through the prostate in time.

With a 40 slice CT scanner we scan a large volume of the prostate with a high temporal (1.5 s) and spatial (0.5x0.5x5 mm) resolution. Moreover, because of the linearity between CT signal enhancement and contrast concentration increase, quantitative analysis is greatly facilitated. We calculate quantitative perfusion maps of the complete prostate by using the tissue homogeneity model, which determines the response of a voxel to the measured input bolus. Furthermore, we have performed an extensive signal-to-noise analysis to determine the optimum between voxel size and flow accuracy.

We have included 11 patients in our study with biopsy proven prostate cancer (stage T3). The CT exam was performed prior to external beam radiotherapy.

Results:

For all 11 patients we have successfully calculated perfusion maps with an accuracy of 10% and a resolution of 1.5x1.5x5 mm.

We find the average perfusion of the prostate to be 15 ml/100g/min, while the elevated regions have average values of 60-70 ml/100g/min. These hotspots, which are identified as the GTV, can be delineated in three dimensions based on the flow maps and are found to correlate well with the clinically known GTV.

Conclusion:

Using DCE-CT we can determine three-dimensional quantitative perfusion maps of the complete prostate. Elevated flow regions correlate well with the clinically known GTV, and may be of value to improve delineation of the GTV within the prostate.