AbstractID: 4334 Title: Metrics for assessment of reproducibility of respiratory motion for four-dimensional computed tomography imaging

Purpose:

Image data sets obtained via four-dimensional (4D) computed tomography (CT) quantify motion of internal anatomy as a function of the patients' unique respiratory cycle. Crucial to the acquisition of high-quality 4D CT data sets is the regularity of the respiratory cycle. The purpose of the present study is to develop metrics that can be used to assess the regularity of respiratory motion, as well as software that can readily extract these metrics from files containing respiratory information generated in a course of 4D CT image data acquisition.

Method and Materials:

4D CT image data sets from 282 patients were acquired, along with files describing motion of an external fiducial that gathered respiratory patterns. Software was developed to calculate the mean amplitude and standard deviation of the amplitude, the mean period and standard deviation of the period of each respiratory data set, and the cross-correlation of the fiducial amplitude in each respiratory cycle with the mean amplitude.

Results:

The range of mean amplitudes was 3.45 mm. to 29.26 mm., and the associated standard deviations ranged from 0.04 mm. to 10.64 mm. The mean breathing rates ranged from 2.39 to 10.88 sec., with a range of standard deviations of 0.02 to 10.92 sec. Histograms were generated that relate the various metrics assessed and the variability encountered. The cross-correlation can be readily displayed for each respiratory cycle.

Conclusion:

The data obtained is thus available to correlate with the quality of the 4D CT images.

Conflict of Interest (only if applicable):