AbstractID: 3683 Title: Implementation of Averaged 4D CT imaging for extracranial stereotactic radiation therapy

Purpose: To implement Averaged 4D CT imaging to measure the motion of lung tumor during breathing

Method and Materials: Averaged 4D CT images are obtained by averaging 4D CT images. A Philips Brilliance 16P CT scanner is used to obtain 4D CT images. The scanner acquired 16 parallel slices per couch position and 25 cinematographic images per slice to produce a ciné image set. The corresponding images are then averaged at each slice. All averaged images are assembled longitudinally to produce a series of Averaged 4D CT images, whose pixel value therefore contains the information about the movement of the target anatomy. An egg-shaped object and a block-shaped object were used for testing. A few patients were also studied and evaluated.

Results: Phantom results showed that Averaged 4D CT images could accurately record the movement of a target having a natural breathing frequency. Results with lung tumor showed that Averaged 4D CT images gave a significantly larger GTVs resulting in larger PTVs, compared with helical CT images. Both the phantom and patient results clearly showed fuzzy areas as a consequence of moving anatomy. The time needed for creating an Averaged 4D CT image set from original 4D CT image set with 5 cinés and 400 slices per ciné is about 370 seconds.

Conclusion: This technology can be accurate and practical for approximating the location of moving anatomy if used properly. Therefore, Averaged 4D CT images can replace helical CT images for radiation planning and treatment purposes with the advantage that they have greater precision than standard helical scans.

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