AbstractID: 8882 Title: Deformable lung phantom for verification of 4D dose calculations

Purpose: 4D dose calculations have been developed that explicitly incorporate patient motion and deformation in the calculation of dose. Before these calculations can be used in the clinic it is necessary to evaluate and verify their accuracy. The purpose of this study was to develop a deformable lung phantom for verification of 4D dose calculations.

Methods and Materials: The Radiological Physics Center (RPC) had previously developed an anthropomorphic thoracic phantom with inhomogeneities and an imageable target. An insert was built for the lung cavity of this phantom to incorporate motion and deformation. The insert was composed of disks of sponges of different compressabilities and a computer controlled motor-driven piston to compress the sponges. The control system is capable of reproducing measured respiratory motion traces as well as simple sinusoidal motions. A tissue-equivalent target was placed in one of the sponge disks and planes of films were distributed throughout the target and between sponge disks.

Results: The choice of sponge compressibility, thickness, and order has allowed us to shape the lung motion to mimic clinically observed deformations. In addition the design of the deformable phantom offers flexibility of target position and motion, film placement and diaphragm motion pattern.

Conclusion: The deformable lung insert for the RPC phantom provides an anthropomorphic phantom that can be used to verify the accuracy of 4D dose calculations.

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