

AbstractID: 4927 Title: Tissue equivalent phantoms for the evaluation of tube current modulated CT dose and image quality

Purpose: To develop and test new, flexible, tissue-equivalent phantoms for the evaluation of tube current modulation dose reduction and image quality in CT. The developed phantom material also has applications for mammographic and 4-D time varying phantoms.

Method and Materials: A compressible, flexible, urethane-based tissue equivalent phantom material was developed and utilized in the production of ellipsoid shaped phantoms for CT imaging. Multiple phantoms were created, each with different major (26-40 cm) and minor (18-28 cm) axes, in order to model patients of varying dimensions and thicknesses. All phantoms were made to be integrated with a Catphan CT image quality phantom as well as CTDI dose assessment phantoms. Image evaluation software was utilized in order to evaluate several image quality parameters in CT images taken using the phantoms in order to quantify the effects of tube current modulation in CT scanners for varying techniques. Ion chamber and gated fiber optically coupled dosimeters were also used with the phantoms in order to evaluate the effects of tube current modulation on dose to patients of varying dimensions.

Results: It was found that the use of ellipsoid shaped phantoms allowed for more accurate observation of dose and image quality effects of tube current modulation in CT scanners over traditional circular acrylic phantoms. Patient doses were found to be less for studies in which tube current modulation was in use as compared to standard CT techniques, however the degree of dose reduction was found to be largely influenced by the major and minor axes of the ellipse.

Conclusion: This work shows potential of ellipsoid phantoms to aid in dose reduction in CT scanning through tube current modulation by allowing more accurate modeling of actual patient dimensions.