

AbstractID: 10695 Title: A novel application of MRI-polymer gel dosimeter for measurement of CTDI on X-ray 64 slices CT scanner

The purpose of this study is to measure the Computed Tomography Dose Index (CTDI) of GE multi-slice CT scanner(64-slice) using polymer gel dosimetry based on MRI imaging (MRPD). CTDI is the sum of point doses along the central axis and estimates the average patient dose during CT scanning.

For measuring CTDI, after designing and fabricating the phantom and preparing MAGIC-gel, MRI imaging using 1.5 T Siemens MRI scanner was performed with imaging parameters of ST=2mm, NEX=1, TE=20-640 ms and TR=2000 ms. CTDI was measured with a 100 mm ion chamber (CTDI₁₀₀) and also MAGIC gel with MRPD method for 10 mm and 40 mm CT scan nominal width.

With measuring CTDI₁₀₀ for 10 mm and 40 mm nominal slice width of multi-slice scanner with the use of both ion chamber and MAGIC gel, the results showed that ion chamber underestimates CTDI₁₀₀ by 28.71% and 14.03% compared to gel respectively for 10 mm and 40 mm.

It was concluded from this study that gel dosimeters have the capability to measure CTDI in wide beams of multi-slice CT scanners whereas 100 mm standard ion chamber due to its limited length is not reliable even for 10 mm beam width. In addition, due to 3 dimensional nature of gel dosimetry, by using MAGIC polymer gel it is possible to obtain a lot of important information from the mentioned profiles such as the actual slice thickness and z axis geometric efficiency. In addition to the stated parameters, the percent of the total homogeneity and partial homogeneity in the slice plane can be obtained only from the gel dosimetry. The results of this study show that MAGIC polymer gel based on MRI can be used as a supplementary method in measuring conventional ion chambers dosimetry especially in measurements of more than 2 mm slice width.