



#RSNA14: Reducing Radiation Exposure: Shield CT Patients?



Providing shielding to patients undergoing computed tomography (CT) examinations reduces radiation exposure, offers a reasonable method, ensures maximum radiation protection and is well accepted by patients, according to a study presented by Luke Byers, DO, Imgen, at the Radiological Society of North America (RSNA) annual meeting in Chicago.

Byers presented the results of their experiences of providing shielding to patients undergoing CT exams. Exposure was measured by radiation detectors placed above equipment.

Concern for patient exposure is not new, said Byers, quoting a 1951 editorial from *Radiology*:

“With the present widespread use of radiological methods of diagnosis by both trained and untrained personnel, the problem of protection from direct and stray radiation has assumed increasing importance. In the case of the operator, the danger may lie in exposure to stray radiation over a long period of time or in injudicious exposure to direct radiation as a result of inadequate shielding or disregard of safety factors. The patient may be unwittingly over-irradiated because of poor judgement on the part of the radiologist or may suffer from the cumulative effect of successive examinations when a full history of earlier exposure has been withheld.”

In 2004 medical x-rays were listed as human carcinogens for the first time. Any imaging exam using ionising radiation carries a risk, due to the cumulative amount of radiation that patients receive. The National Council on Radiation Protection and Measurements reports that the U.S. population is now exposed to 6-fold increased medical radiation compared to 1980 levels. Annual per capita exposure has increased from 0.54 mSv in 1980 to 3.2mSv in 2006. Collective population exposure is 7.5 times higher over the same period (124,000 to 930,000 mSv).

In the United States there has been a massive increase in CT exams, from 18.3 million CT exams in 93 to 85 million in 2012. CT exams represent 10 percent of all imaging studies but 67 percent of all imaging radiation. Estimates of potential cancer deaths in the United States from CT are 1.5-2 percent. Patients may undergo repeated CT exams over their lifetime, hence the importance of providing shielding, argued Byers.

Their study covered a five year period (2008-2013). All patients undergoing CT exams were given the option of comfortable, reusable, protective, lead-free radiation shielding. 125 patients were monitored for radiation dose outside the area of interest being scanned during their CT exam. During the study period, there were 28,715 CT exams, of which 19,384 were body scans, and 9,331 were head scans.

Introducing the policy of offering radiation protection material involved minimal training and expense. No patient

refused to use the radiation protection material, which included lead-lined glasses.

Overall there was a 48 percent decrease in all regions to radiation received to the area outside the area being scanned in the 145 CT radiation measurements obtained. 33 patients had two areas monitored. Average patient dose reductions were Brain/Sinus (60 percent), Abdomen (46 percent), Abdomen/Pelvis (45 percent), Chest/Cardiac (51 percent), CTA (43 percent), and extremities (77 percent). Thyroid shielding for abdomen and pelvis studies was of limited effectiveness because of high levels of internal scatter. Scout imaging provided relatively negligible (0.001-1.0 millirem) patient radiation exposure.

Responding to audience questions as to whether this was a solution in search of a problem, as the radiation being saved is outside the primary beam, Byers clarified that their results could not quote the radiation dose received to the area outside the area of interest as a percentage of the total radiation dose received.

Asked if the shielding process slows down the workflow, Byers explained it takes about 2 minutes per patient. Cleaning the materials uses the same method as for lead aprons.

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