

ABSTRACT

Computed tomography is able to clearly display anatomical structure and support diagnosis, but the large scanning area triggers high doses of ionizing radiation so radiation protection is necessary in the use of this modality. This study aims to evaluate the optimization of the use of silicon rubber-tungsten (SR-W) radiation shields with a percentage variation of 100-0, 97-3, 94-6, 91-9, 88-12, 85-15 wt% on the absorption of X-ray radiation dose and the effect on the quality of the Abdomen CT Scan image. The material characteristics tests carried out include density, homogeneity tests and X-Ray (EDX) energy dispersive tests. With the addition of tungsten percent, the density increased from 1.108 g/cm³ at 100-0 wt% to 1.225 g/cm³ at 3 wt%, the optimal density at tungsten addition to the limit of about 3–6 wt%, moreover the effects of agglomeration and prognosis began to inhibit the increase in the ideal density. The homogeneity test results between 77.7% to 94% showed a fairly high level of homogeneity (>75%) and the optimal homogeneity was at SR-W 94-6wt% with 93.7%. EDX testing confirmed the presence of tungsten from 2.45% to 25.02% at 85-15wt%. Dose reduction testing used abdominal anthropomorphic phantom, without and with SR-W radiation shielding at tubular voltage variations (kVp) from 80, 100, 120, to 140 kVp, percentage decrease at 80 kVp (11.72 to 43.25%), at 100 kVp (8.59 to 37.24%), at 120 kVp (6.74 to 33.22%), at 140 kVp (6.31 to 30.65%). The evaluation of image quality was analyzed using signal to noise ratio (SNR) values and contrast to noise ratio (CNR) values, with fluctuations in the SNR-CNR value at optimal values of 3.8-6.2 for 80 kVp, 8.7-7.0 for 100 kVp, 15.7-6.5 for 120 kVp and 12.7-8.0 for 140 kVp, optimal image quality at the SR-W percentage of 94-6wt% because it provides the best balance between attenuation, noise reduction, and contrast CT Scan images. Therefore the SR-W gonadal radiation shield can be applied clinically for the optimization of the resulting dose and imagery.

Keywords: CT Scan of abdomen, Silicon Rubber-W, Image Quality