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A study on performance of low-dose medical radiation shielding fiber (rsf) in ct scans

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Abstrak

In modern medicine, a radiation scans is an very important examination tool for making a diagnosis and subsequent treatment plan. Among the range of medical examinations, Computed tomography (CT) is being performed in an increasing number of cases and a CT scan uses the most radiation of any diagnostic exam. On the other hand, radiation protection during scanning is not typical for bodily regions other than those designated for examination. Therefore, the aim of this study was to develop a lead-free fused radiation shielding fiber (RSF) and to evaluate its effectiveness with a view to reducing radiation exposure to only the effective dose or less in a CT scan by means of a multilayer structural coating. A GE High Speed Advantage Spiral CT was used to conduct measurements using a FH-40G (Eberline, USA) proportional digital counter survey meter. In a brain CT scan, abdominal CT scan, and knee CT scan, two-way ANOVA was used to analyze the changes in radiation dosage and to examine the correlation based on body parts and thickness of the RSF. In addition, when significant results were obtained, a Duncan post hoc test was used to examine the difference depending on each condition. In the brain CT scan, the highest exposure to secondary radiation was measured in the chest, which was closest in distance. The use of a 3- mm shielding fiber resulted in a shielding effect of approximately 65% shielding effect compared to the initial exposure dose. In the abdominal CT scan, no exposure dose was detected in the head area, which had been shielded with the 3-mm shielding fiber. In a knee CT scan, 1-mm shielding fiber was sufficient to demonstrate a shielding effect. The RSF developed in this study may help reduce low-dose exposure to secondary X-rays, such as scattered rays.