UNIVERSITI TEKNOLOGI MARA

# EVALUATION OF RADIATION DOSE AND IMAGE QUALITY OF CT IMAGING FOR DIFFERENT PHANTOM SIZES

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MSc

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# AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of own work unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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# ABSTRACT

Worldwide, the number of Computed Tomography (CT) examinations performed is increasing. An initiative was issued by the Food and Drug Administration (FDA) in 2010 to reduce unnecessary radiation exposure from CT imaging. This study aims to evaluate the effect of low tube voltage on radiation dose and image quality using CTDI phantom. The CTDI phantom was scanned with dual-energy CT at 80 kV and 120 kV with the tube current from 150 mAs to 350 mAs. Pitch value was 1.0 while the slice thickness was 1 mm and 5 mm. Results showed that the signal to noise ratio (SNR) values increased when mAs increased. The 5 mm slice thickness showed higher SNR value compared to 1 mm slice thickness. As the tube voltage and tube current increased, the amount of dose absorbed also increased as the current is proportional to a photon flux. Though, the optimal image quality still can be achieved with the reduction of voltage and current to 80 kVp and 300 mAs as well due to reducing unnecessary radiation. However, the radiation dose in pediatric head Computed Tomography examination was reported that decreasing tube voltage in CT examination could reduce the dose to patients significantly. A head phantom was scanned with dual-energy CT at 80 kV and 120 kV. The tube current was set using automatic exposure control mode and manual setting. The pitch was adjusted to 1.4, 1.45 and 1.5 while the slice thickness was set at 5 mm. The dose was measured based on the CT Dose Index (CTDI). Results from this study have shown that the image noise increases substantially with low tube voltage. The dose increases up to 17.19 mGy when the CT tube voltage increases to 120 kV. With the reduction of tube voltage from 120 kV to 80 kV, the radiation dose can be reduced by 12.1% to 15.1% without degradation of contrast-to-noise ratio.

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