

ABSTRACT

One of the image quality parameters in computed tomography (CT) is low-contrast detectability (LCD). LCD analysis is generally performed using quantitative methods, such as Contrast-to Noise Ratio (CNR) calculation, and visual methods based on observer assessment. Previous studies evaluating LCD using the AAPM CT Performance Phantom have primarily focused on CNR measurements. Therefore, this study compared LCD results obtained from CNR measurements and visual observation to determine the extent of differences between observer's ability to detect low-contrast objects and CNR calculations. The evaluation was based on the CNR cut-off value, where an object is expected to remain detectable when $CNR > 1$. In this study, AAPM CT Performance Phantom Model 610 were acquired using varying tube voltages of 80 kV, 100 kV, 120 kV, and 140 kV. The low contrast module (Module 06) of the phantom contains objects with diameters ranging from 2,5 mm to 7,5 mm, with increments of 0,5 mm between adjacent objects. The analysis was conducted by measuring the CT number and noise of each object, which were subsequently used to calculate the CNR. In addition, a visual assessment was performed to identify the smallest object that could still be detected by observers. The results demonstrated a discrepancy between the smallest detectable object determined by CNR calculation and visual observations. Based on the CNR analysis, objects with a diameter of 3 mm remained detectable. However, observers were only able to visually identify objects with a diameter of 3,5 mm, while objects smaller than 3,5 mm could no longer be distinguished due to limitations of human visual perception.

Keywords: *low-contrast detectability, contrast-to noise ratio, AAPM CT Performance Phantom, visual assessment, and observer.*