

## ABSTRACT

The availability of phantoms for quantification test and CT Number accuracy test on DECT images is still limited, so alternative phantoms are needed. The aim of this study was to develop an alternative phantom with iodine and calcium inserts for CT Number quantification and accuracy test on DECT images. The phantom was made from Polyester resin mixed with Methyl Ethyl Ketone Peroxide (MEKP) as catalyst with a ratio of 300:1. The phantom is 16 cm in diameter and 5 cm in height. There are 10 holes in the phantom, each with a diameter of 1.5 cm. Each hole was filled with water, air, iodine (with varying concentrations of 5; 7.5; 10; and 15 mg/ml) and calcium (with varying concentrations of 200, 300, 500, and 600 mg/ml). Imaging was performed using Ultrafast kV Switching type GE DECT with tube voltage of 80/140 kV, slice thickness of 5 mm, rotation time of 0.5 s and tube current (with variations of 200, 250, 300, 335 and 370 mA). Images were reconstructed to Material Density Image (MDI) and Virtual Monochromatic Image (VMI) at 50, 70 and 100 keV energy levels and then Region of Interest (ROI) was performed using IndoQCT. Absolute Percentage Error (APE) was calculated for each concentration value and the measured CT Number was compared to the reference value. Increasing the tube current did not always improve the measurement accuracy. The results showed that the APE for concentration measurement on iodine was <15% while that on calcium was <25%. For the CT Number accuracy test, calcium and iodine showed the same trend. The CT Number will increase as the material concentration increases but decreases as the VMI energy increases. The APE of CT Number is <32% for iodine and calcium.

Keywords: Dual Energy CT, Quantification test, CT Number, Phantom