ABSTRACT

Spatial resolution is the ability of an imaging system to distinguish the smallest objects in two dimensions. Spatial resolution can be presented using the Modulation Transfer Function (MTF), which is a representation of the relationship between system modulation and spatial frequency with a limit value of 10%. MTF calculations need to be evaluated in all planes, not only in the axial (x), axial (y), sagittal (z), and coronal (z) planes, but also in planes that are not parallel to the x, y, and z axes. The addition of diagonal wires that intersect the center point of the phantom (oblique) can represent this condition in order to increase the spatial direction coverage, especially for anatomical representations that are not always parallel to the x, y, and z axes. The purpose of this study was to create a phantom with the addition of diagonal wires to determine and analyze the resulting 3D MTF and Oblique MTF values. The variations used were wire diameter and reconstruction filter. The phantom was made of acrylic filled with water with stainless steel wire components with diameters of 0.2 mm and 0.3 mm. Scanning was performed using a GE Revolution 128-slice CT scanner, and the images were processed using IndoQCT software. The results of the 3D MTF and Oblique MTF showed that the bone filter produced a higher MTF 10% value than the soft filter in the axial (x, y) and oblique planes. However, there was no significant effect of filter use in the sagittal (z) and coronal (z) planes. Furthermore, when using the bone filter, a smaller wire diameter produced a higher MTF 10% value, but when using the soft filter, the wire diameter had no effect in the axial (x,y) and oblique planes. The conclusion of this study is that a phantom designed for 3D MTF and Oblique MTF measurements has been successfully created. The reconstruction filter only works on the axial (x), axial (y), and oblique planes. Meanwhile, the wire diameter only significantly affects the sagittal (z) and coronal (z) planes.
Keywords: 3D MTF, Wire Diameter, Reconstruction Filter, Oblique MTF