AbstractID: 11473 Title: Assessment of the spatial resolution of digital imaging systems using a star pattern

Purpose: To demonstrate a method of measuring the modulation transfer function (MTF) of digital imaging systems using the common star pattern test tool. The goal of this research is to develop a technique that brings precise and objective evaluation of spatial resolution to routine quality control in radiography and fluoroscopy.

Method and Materials: Images of a 2-degree star pattern were obtained on a variety of digital radiographic imaging systems, spanning a range of spatial resolution performance levels. One-dimensional profiles from concentric circles around the center of the star were obtained from each star image. The circular profiles were unwrapped to produce a series of square waves, which were analyzed to produce the square wave response function (SWRF). Droege's method was used to compute the MTF from the SWRF. The MTF determined using the star pattern method was compared to published and quality control measurements of the MTF for several digital mammography and digital radiography systems. In implementing this method, important parameters that must be considered include the radial and angular sampling rates, the method for determining the zero-frequency normalization and correction for beam nonuniformity.

Results: The MTF computed from star pattern profile measurements closely matched the MTF obtained using other methods over the range of spatial frequencies between the Nyquist frequency and 1/3 of the Nyquist frequency. The star pattern MTF, which is a system measurement and includes the effects of detector and geometric unsharpness, was within 6-8% of reference values obtained from the scientific literature for two models digital mammography equipment.

Conclusion: Images of a 2-degree star pattern can produce estimates of the two-dimensional system MTF. This method may offer a convenient means of assessing the spatial resolution of digital imaging systems for acceptance testing and quality control.

Conflict of Interest (only if applicable):