Abstract

New released DR detector (Canon CXDI 70C wireless) tested at premature neonates chest examination focusing on dose and image quality.

Background: Canon has recently released a new wireless DR detector based on a new technical design; which has a smaller pixels size and a higher fill factor than previous detectors on the market. Higher fill factor results, in theory in a higher sensitivity thus possibly decreasing the dose while maintaining image quality - in accordance with the ALARA principle. Dose reduction is particularly interesting in paediatrics because of the high radiation sensitivity of children. In preterm, a dose reduction has even greater importance, and because the anatomical structures in the chest are extra small, the requirements for image quality are high as even the smallest details can make a difference in the diagnosis of the child.

Purpose: To investigate whether there is potential dose savings associated with using the new detector rather than the previous model at chest examination of preterm neonates and still maintaining image quality at a diagnostic level.

Methods and Materials: A quantitative experimental study based on experiments with technical and human phantoms. A technical CDRad phantom was used and the images were analyzed using CDRad software, giving results as objective IQF values. A human neonates chest phantom by Gammex was used and the images analyzed by 3 radiologists specialized in pediatric chest examinations using the Visual Grading Analysis (VGA). Images were taken at all combinations of exposure parameters from 50 to 80 kV and 0.1 to 2.0 mAs and all dose measurements was controlled through Monte Carlo and analyzed in conjunction with exposure index values. Statistical analysis supported the results.

Results: The IQF value from the technical phantom is clearly higher at the new detector at all exposure values as well as the VGA shows great potential for improving image quality and possibilities to reduce the dose, especially at the lower kV levels. Software optimization improves the images at higher kV even though the dose effect will always influence the experienced image quality.

Conclusion: Optimal image quality can be maintained at a lower dose level on the new detector for pediatric chest examinations. Exposure index values are clearly higher on the new detector at all kV levels,

which means the sensitivity is approximately 45 % higher than the previous detector which will benefit image quality. The final statistical calculations will be available in January 2011.