

The new released Canon CXDI-70C Wireless detector maintains diagnostic image quality of the chest anatomy in preterm infants at a reduced radiation dose

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PURPOSE

To investigate if use of the new detector (CXDI-70C Csl) can reduce the radiation dose compared with a previous model (CXDI-55C) and still produce an image quality of the chest region of the preterm infant enabling establishment of a diagnosis.

CONCLUSION

Optimal image quality can be maintained at a lower dose level using the CXDI-70C detector for chest radiography in preterm infants. REX values are clearly higher on the CXDI-70C at all kV levels and correspond to an approximately 45 % higher detector sensitivity compared with the CXDI-55C detector which is approved by the scientific experiments.



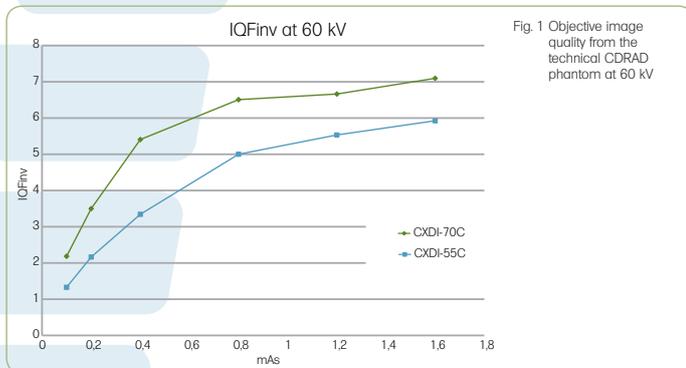
BACKGROUND

Canon has recently released a new wireless direct digital radiography (DR) detector featuring a smaller pixel size and a higher fill factor than previous detectors. Theoretically, a higher fill factor results, in increased sensitivity thus enabling a reduction in radiation dose still maintaining image quality in

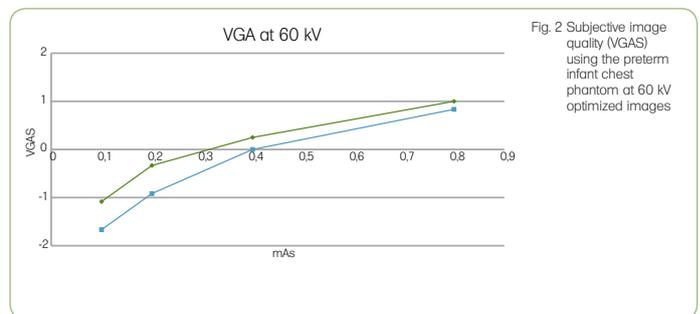
accordance with the ALARA principle. Dose reduction is particularly relevant in preterm infants who are very sensitive to radiation doses; the small size anatomical structures in the chest of preterm infants requires a high image quality to establish a diagnosis.

RESULTS

The IQFinv values from the CDRAD phantom were statistically significantly higher for the CXDI-70C at all exposure values. Thus, contrast and spatial resolution were improved and sensitivity increased using the CXDI-70C detector.



The VGA results suggested improved image quality and the possibility of a dose reduction, especially at lower kV levels. Similar differences between the two detectors are seen at 50 and 70 kV. Software optimization improved the images at higher kVs even though the dose effect will also influence the image quality.



REX values were on average 51% higher at all kV values using the CXDI-70C detector compared to the CXDI-55C. This indicates that the CXDI-70C had a higher sensitivity and offers the possibility for dose reduction.

MATERIALS AND METHODS

The study was based on experiments using two types of test phantoms: A technical CDRAD phantom with PMMA absorber was used; images were analyzed with software giving results as objective IQF values. The IQF value relates directly to the spatial and contrast resolution in the images. A preterm infant chest phantom from Gammex was used for anatomical

references and the images were analyzed independently by three radiologists specialized in pediatric chest examinations using the Visual Grading Analysis (VGA). The VGA results from the use of image criteria (Table 1), which are given a score (Table 2) when compared to images produced with a higher radiation dose using the CXDI-55C detector.

NUMBER	IMAGE CRITERIA
1	Sharpness of Carina of the trachea
2	Sharpness of the bronchus lobe
3	Sharpness of the heart limitation
4	Sharpness of the vascular pattern
5	Sharpness of pneumothorax
6	Visualization of vascular pattern according to costae

Table 1 Image criteria used in the VGA on the preterm infant chest phantom

The experimental images were taken at all combinations of exposure parameters from 0.1 to 0.8 mAs and 50, 60 and 70 kV; all dose measurements were controlled by the Monte Carlo method and analyzed in conjunction with exposure index values (REX).

SCORE	VISUALIZATION OF STRUCTURES IN THE IMAGES
+2	Clearly better than the reference image
+1	A little better than the reference image
0	Comparable with the reference image
-1	A little worse than the reference image
-2	Clearly worse than the reference image

Table 2 VGA score used for all image criteria by each radiologist