COMPUTED RADIOGRAPHY AND DIRECT RADIOGRAPHY OF CHEST RADIOGRAPHIC IMAGING: A COMPARISON OF IMAGE QUALITY AND ENTRANCE SKIN DOSE FOR VARIOUS SYSTEMS

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Purpose: The aim of the study was to compare the image quality and entrance skin dose (ESD) in chest radiography for various computed radiography (CR) and direct radiography (DR) systems.

Methods: The study was performed using a chest phantom made from a tissue-equivalent PMMA block with embedded copper and aluminium sheets, plastic tubing, which were shaped to resemble frontal radiographic projections of human thoracic structures. Regional test objects (a matrix of contrast-detail objects and line-pair phantom) were incorporated into the chest phantom for image quality assessment in the lungs, heart and retrodiaphragmatic areas. Chest phantom images were acquired using three different CR systems, namely Konica (new generation), Philips and Konica (old generation), and three different DR systems, namely Siemens, Philips and Toshiba. Imaging parameters were selected with mAs ranging from 1.0, 2.0, 4.0, 8.0 and 10.0, and tube potential ranging from 100, 110 and 120 kV. ESD was measured using a solid state detector (PTW Diados, Germany). Quantitative measurements of image quality were performed at 7 regions of interest to determine the relationship between image noise (SD-standard deviation), imaging parameters and different digital systems. Statistical analysis was performed using ANOVA and Duncan's multiple-comparison test.

Results: The ESD measured with Konica CR (new generation) was the lowest (mean dose of all 15 imaging parameters: 0.11 mGy) among the three different CR systems, and the lowest with Philips DR system (mean dose of all 15 imaging parameters: 0.14 mGy) among the three different DR systems. ESD increased significantly with increase of mAs ($p<0.0001$) and kVp ($p<0.01$). The SD measured in different regions of interest decreased significantly ($p<0.001$) when the mAs was increased, however there was no significant difference of SD when the kVp value was changed (p=0.11-0.78). The SD measured with DR systems was significantly lower than that measured with different CR systems ($p<0.001$).

Conclusion: Our results showed that chest radiographic imaging with different CR and DR systems can be optimised by reducing the kVp from 120 to 100 without compromising image quality, while reducing the ESD significantly. The DR systems performed differently from CR systems with lower noise achieved, indicating that DR produces better image quality than CR with same imaging protocols in chest radiographic imaging.