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Image Quality and Dose Optimisations in Digital and Computed Radiography X-ray Radiography Using Lumbar Spine Phantom

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Abstract : A study was performed to management and compare radiation doses and image quality during Lumbar spine PA and Lumbar spine LAT, x- ray radiography using Computed Radiography (CR) and Digital Radiography (DR). Standard exposure factors such as kV, mAs and FFD used for imaging the Lumbar spine anthropomorphic phantom obtained from average exposure factors that were used with CR in five radiology centres. Lumbar spine phantom was imaged using CR and DR systems. Entrance surface air kerma (ESAK) was calculated X-ray tube output and patient exposure factor. Images were evaluated using visual grading system based on the European Guidelines on Quality Criteria for diagnostic radiographic images. The ESAK corresponding to each image was measured at the surface of the phantom. Six experienced specialists evaluated hard copies of all the images, the image score (IS) was calculated for each image by finding the average score of the Six evaluators. The IS value also was used to determine whether an image was diagnostically acceptable. The optimum recommended exposure factors founded here for Lumbar spine PA and Lumbar spine LAT, with respectively (80 kVp,25 mAs at 100 cm FFD) and (75 kVp,15 mAs at 100 cm FFD) for CR system, and (80 kVp,15 mAs at100 cm FFD) and (75 kVp,10 mAs at 100 cm FFD) for DR system. For Lumbar spine PA, the lowest ESAK value required to obtain a diagnostically acceptable image were 0.80 mGy for DR and 1.20 mGy for CR systems. Similarly for Lumbar spine LAT projection, the lowest ESAK values to obtain a diagnostically acceptable image were 0.62 mGy for DR and 0.76 mGy for CR systems. At standard kVp and mAs values, the image quality did not vary significantly between the CR and the DR system, but at higher kVp and mAs values, the DR images were found to be of better quality than CR images. In addition, the lower limit of entrance skin dose consistent with diagnostically acceptable DR images was 40% lower than that for CR images.

Keywords : image quality, dosimetry, radiation protection, optimization, digital radiography, computed radiography
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