

Purpose:To investigate the effect of using higher x-ray tube voltage (kVp), than those recommended by manufacturers, on patient dose and image quality during digital radiography (DR) examination of the Lumber Spine.

Methods:Reference images of an RSD (Radiology Support Devices, Long Beach, CA, USA) anthropomorphic lumber spine phantom were obtained using 3 different DR systems using exposure factors, kVp and tube-current time product (mAs), recommended by the manufacturer of each system. Test images were obtained, on each system, using kVp values which were 15% and 30% higher than those recommended by the respective manufacturers, while reducing the mAs to 50% and 25% respectively of the reference exposure. The images were evaluated subjectively by 3 experienced Radiologist using the image quality criteria recommended by the Commission of the European Communities (CEC) for LS examination, on a 5-point scale. For each image, the entrance surface exposure, including backscatter, to the phantom was measured using the Victoreen Model 8000 NERO TM mAx system and the entrance surface dose and effective dose were calculated. Any statistically significant differences between the average scores for the images were tested using Kruskal-Wallis test at $p=0.05$.

Results:The average score from the 3 Radiologists were above the clinically acceptable levels for all of the images. Within each system, the average scores for the images obtained with different exposure factors did not show any statistically significant differences. The entrance surface doses to the phantom and the calculated effective doses decreased by approximately 30% for a kVp increase of 15% and approximately by 50% for kVp increase of 30% in all 3 systems.

Conclusions:Dose reduction up to 50% can be achieved without affecting the diagnostic quality of all images in the 3 systems by using kVp and mAs values other than those recommended by the DR system's manufacturer.