Evaluation of Patient Doses in Conventional, Computed and Digital Radiography

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Introduction: The transition from film screen-radiography (FSR) to computed radiography (CR) or digital radiography (DR) can involve an increase in patient radiation doses due to the wide dynamic range of the digital imaging systems.

Objectives: The current study intends to measure and compare the radiation dose to adult patients during (i) chest (CXR) (ii) lumbar spine (LS) (iii) others; in three hospital in Khartoum state , Sudan. Using :
(i) conventional (Film-screen) radiography (ii) computed radiography (iii) digital radiography.

Methods: Entrance surface doses (ESDs) were calculated from patient exposure parameters using DosCal software for three imaging modalities. A total of 202 patients were studied (115 CXR, 78 LS and 9 Others).

Results: The mean ESDs were 0.27 mGy for the AP/LS, 0.67 mGy for LA/LS and 0.18mGy for the CXR in FSR. The mean ESDs were 1.03 mGy for the AP/LS, 1.55mGy for LA/LS and 0.10 for the CXR in CR and The mean ESDs were 0.91 for the AP/LS, 1.53mGy for LA/LS, 0.09mGY for the CXR and 0.2mGy for other in DR. The ratio of ESDs for CR to SFR were +44%, +26% and +57% higher than those for SFR during AP/LS.

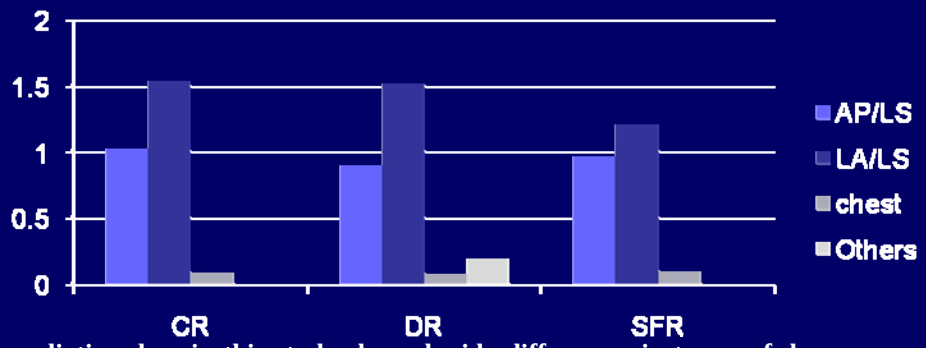
Table 1. entrance surface dose (mGy) for standard radiographic examinations using conventional radiography (SFR), computed radiography (CR) and digital radiography

Examination	SFR	CR	DR	CR vs SFR	DR vs SFR	DR vs SFR
AP/LS	1.77±0.01	2.54±0.05	1.16±0.44	+44%	-34%	-54%
LA/LS	4.27±0.04	5.39±0.16	1.72±0.45	+26%	-60%	-68%
PA chest	0.07±0.02	0.11±0.01	0.06±0.04	+57%	-14%	-45%

Table 2. comparison between mean ESD (mGy) in different examination and previous studies

Examination	Present study			H.Osman (2010)	Kepler.k et al(8)	Hanner Anja(9)	Olivera Ciraj et al(7)
	CR	DR	SFR				
AP/LS	2.54±0.05	1.16±0.44	1.77±0.01	0.71±38.61	10.7	15	2.2±1.0
LA/LS	5.39±0.16	1.72±0.45	4.27±0.04	0.61±55	6.4	5	1.6±1.0
PA chest	0.11±0.01	0.06±0.04	0.07±0.02	0.23±44.3	0.3	0.2	0.2±0.14

Figure1, Correlation between mean ESD (mGy) for(AP and LA lumbar spine, chest and others) in three modalities



Conclusions: The radiation dose in this study showed wide differences in terms of dose, exposure factors and inter-examiners. Patient dose in Computed radiography were lower than other two imaging modalities. Digital radiography dose values were higher than the other two modalities. LS patient dose values were lower than the previous studies in all modalities while the CXR doses were higher than the previous studies. Radiation dose optimization is highly required.

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