

Classification Of Small Pneumoconiotic Opacities: Exploration Of Differences Between Conventional And Digital Chest Radiographs

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Introduction:

We recently (Laney et al, Eur Resp J, 2010) compared the recognition of small lung opacities using traditional film-screen radiographs (FSR) and storage phosphor computed radiographs (CR) obtained on the same day from 1388 underground coal miners. Each image was interpreted by two B Readers using the International Labour Office (ILO) pneumoconiosis classification. Small opacities consistent with pneumoconiosis were not related to imaging modality (5.2%, for FSR and 4.8% for CR, $p > 0.50$). ILO profusion category $\geq 2/1$ and irregularly shaped opacities were more common using CR versus FSR. This study explores the previously observed differences between imaging modalities in the classification of small opacity shape and profusion.

Methods:

Miners were included in the current study if at least one reading showed an ILO small opacity profusion $> 0/0$ on either FSR or CR, resulting in inclusion of 172 of the original 1388 miners. FSR were independently interpreted by seven B Readers using the ILO classification of radiographs of pneumoconiosis, as were CR displayed on medical-grade computer monitors.

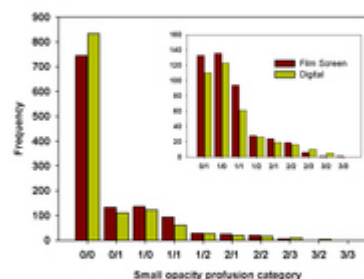
Results:

Readers more frequently classified small opacities as irregular (compared to rounded) when using CR (33.8%) compared to FSR (25.9%), odds ratio (OR) 1.5 and 95% confidence interval (CI) =1.1–2.0. Intermodality agreement was modest with respect to ILO shape/size designation; Cicchetti–Allison weighted kappa=0.51, CI=0.43–0.59 (Table). Opacity profusion $\geq 2/1$ was recorded in 4.2% of CR compared to 4.3% FSR ($P=0.9$). More images were classified as 0/0 using CR (69.2%) compared to FSR (62.7%, OR=1.3; CI=1.1–1.6) (Figure). The major pneumoconiosis category (0 vs. 1,2,3) differed by imaging modality: 74.0% were classified as 0 using FSR compared to 78.4% with CR.

Table

Figure

		Digital Radiography			
		0/0	0/1	1/0	1/1
Film Screen Radiography	0/0	10	10	10	10
	0/1	10	10	10	10
	1/0	10	10	10	10
	1/1	10	10	10	10



Conclusions:

This study confirms that the primary shape of small opacities differs by imaging modality. Opacities are more often labeled irregular when using CR images compared to FSR. We found no difference between modalities in the proportion of profusion categories $\geq 2/1$; however, more CR images were classified as 0/0. Our findings suggest the operating characteristics of CR may enhance the ascertainment of irregular opacities and increase the recognition of normal radiographs. The large number of readings permitted identification of significant differences between modalities, however the magnitude of the observed effects were modest. Further evaluations that incorporate independent measures (e.g., CT scan or exposure histories) will allow us to move beyond equivalence studies and fully elucidate the practical implications of the adoption of digital imaging technologies in the classification of radiographs of pneumoconiosis.

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