



## Letter to Editor

### Poor collimation in digital radiology: A growing concern

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*Sir*

To obtain the desired image quality associated with low patients dose is of greater concern today than in the past due to the increasing number of patients exposed to ionizing radiation<sup>1,2</sup>. The international commission of radiological protection (ICRP) recommends three basic principles of radiation protection comprising: justification, optimization and limitation<sup>3</sup>. Accordingly, it is essential that all patients' exposure is kept "as low as reasonably achievable" (ALARA). Collimating the primary beam to the area of diagnostic interest (ADI) is one of the aspects of optimizing patients' radiation exposure<sup>4</sup> that has strongly been recommended by literature such as the ICRP publication 121<sup>5</sup>. Furthermore, it is recommended that proper collimation is an excellent method for reducing gonadal dose during neonatal and pediatric chest radiography<sup>6</sup>. Adequate collimation reduces the amount of tissue irradiated and also improves image quality by reducing scatter radiation<sup>5</sup>; hence, the importance of proper collimation should not be underestimated. Inadequate collimation is responsible for the highest unnecessary integral dose to patients in diagnostic radiology<sup>7</sup>. It has been reported that variations in gonadal dose are presumably due to variations in collimation<sup>8</sup>. Recommendations for radiation protection origin from the fact that the x-rays can produce genetic and somatic mutations<sup>9</sup>, especially in pediatric radiology due to their high radiation sensitivity and susceptibility to radiation-induced cancers such as childhood leukemia<sup>5,10</sup>. Digital radiography was introduced in the 1980s<sup>11</sup>. Transition from film-screen to digital radiology provides tremendous benefits in medical imaging<sup>4</sup>. The radiation exposure can be reduced by up to 50% without loss of image quality, following use of digital image receptors<sup>12</sup>. Images are produced with lower cost and greater speed. Large amounts of images can be stored in a small space and easily

retrieved for later reference<sup>13</sup>. In addition, image processing makes it possible to correct radiographer's error in the selection of exposure factors; thus, retakes are potentially reduced<sup>14</sup>. However, in spite of these advantages, implementation of digital radiology was associated with some concerns. In the era of film-screen imaging, presence of silver lining (the bright edge of applique field size) in radiographs, enabled radiologists to check the images in term of adequate collimation<sup>4</sup>, while digital radiology systems have electronic software that allow radiographers to electronically mask an unnecessarily large collimation. Therefore, radiologists can no longer realize whether the image is really optimally collimated or is electronically cropped<sup>15</sup>. It seems that implementation of digital radiology has reduced motivation towards proper collimation. A survey of 493 radiographers by the American Society of Radiologic Technologists (ASRT) revealed that half of the respondents used electronic cropping greater than 75% of the time during pediatric radiography<sup>16</sup>. Zetterberg *et al*<sup>15</sup> conducted a study to determine the status of collimation in 86 analog and 86 digital lumbar spine radiographs and reported that the collimation was significantly larger in digital than in analog radiographs (P-value <0.001). The authors emphasized that this large collimation resulted in unnecessarily high radiation doses to patients.

It has been strongly recommended that any protection measure that is easy to use, improves image quality and reduces patient's radiation dose should be used<sup>17</sup>. Therefore, radiographers should make adequate efforts to collimate the primary beam to the ADI.

We believe that the key to retrieving adequate collimation is formation of a radiation protection team comprising of radiologists, radiographers and health physics authorities with focus on practical training programs. To examine compliance, radiologists should check the visibility of the silver

lining regularly. This radiation protection team can also assist in implementation of other protection measures such as shielding. Following this guideline can substantially reduce radiation exposure to patients.

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