AbstractID: 7492 Title: Measurement of X-ray Beam and Grid Misalignment in Portable Chest Radiography using a 3D Test Object

Purpose

X-ray beam to grid alignment is crucial for acquiring high-quality portable chest radiographs. The purpose of this work was to measure x-ray beam to grid alignment by imaging a custom alignment phantom during routine acquisition of portable chest images acquired using computed radiography (CR). A better understanding of typical beam alignment in the clinical practice is expected to be useful to specify the most appropriate grid ratio and to help foster better in-room alignment.

Materials and Methods

The disk-shaped phantom was 5 cm in diameter and 1 cm tall. A 2 cm diameter ring of sixteen 2 mm tungsten balls was positioned at the entrance surface of the phantom and a 4 cm ring of twenty-four balls was positioned at the exit surface. Computer analysis of the phantom on the CR image provided for measurement of the 3D spatial location of the x-ray focal spot with respect to the image center.

Results

Trial measurements using uniform exposure images demonstrated that the (x, y, z) location of the focal spot with respect to the image plane could be measured with error less than 2% of the x-ray source to image distance. A preliminary clinical trial using 20 portable chest images demonstrated that misalignment of the x-ray beam to the grid ranged from 0 to 14 cm (average = 6 cm) in the direction perpendicular to the gridlines.

Conclusions

A phantom and image analysis application was developed to measure the x-ray beam to grid misalignment for CR portable chest radiographs. Initial measurements showed that the precision is appropriate for this task. Preliminary clinical studies demonstrated a relatively wide variation in alignment in the clinical practice. The results of this work will be used to foster better alignment and to specify the most appropriate grid ratio for portable chest imaging.