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Low dose chest CT protocol (50 mAs) as a routine protocol for comprehensive assessment of intrathoracic abnormality

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ABSTRACT

Purpose: To determine the diagnostic capability of low-dose CT (50 mAs) in comparison to standard-dose CT (150 mAs).
Materials and methods: Fifty-nine consecutive patients underwent two non-contrast chest CT scans with different current-time products (50 and 150 mAs at 120 kVp) on a 64-detector row CT scanner. Three board certified chest radiologists independently reviewed 118 series of 2 mm-thick images (2 series for each of 59 patients) in a random order. The readers assessed abnormal findings including emphysema, ground-glass opacity, reticular opacity, micronodules, bronchiectasis, honeycomb, nodules (>5 mm), aortic aneurysm, coronary artery calcification, pericardial and pleural effusion, pleural thickening, mediastinal tumor and lymph node enlargement. Five-point scale from 1 (definitely absent) to 5 (definitely present) was used to record the results. The rates of score agreement between two images were calculated. Deviation of one observer's score from other two observers was compared between low dose CT and standard dose CT.
Results: Mean agreement rate of the lung parenchymal findings between low dose CT and standard dose CT images was 0.836 (range, 0.746–0.926). Mean agreement rates for mediastinal and pleural findings were 0.920 (range, 0.735–1.000). There was no statistically significant difference in the deviation of the observers' scores between low-dose CT and standard-dose CT.
Conclusion: Low dose CT protocol at 50 mAs can produce the screening results consistent with standard dose CT protocol (150 mAs), supporting routine use of low dose chest CT protocol.

1. Introduction

There is an increasing awareness of the possible adverse effects of diagnostic radiation exposure to the patients, because the medical radiation exposure has grown significantly as we utilize medical imaging more often. CT examinations account for majority of radiation exposure related to medical imaging [1,2]. Considering the possible adverse effect, the practice of keeping radiation dose as low as reasonably possible (ARALA principle) should be observed in medical imaging involving ionizing radiation.

As CT is a major cause of radiation exposure buildup, low dose CT techniques is advisable unless it affects management decision. However, replacing a conventional chest CT routine protocol with a low-dose protocol is not a simple task, mainly because of the concern that the image quality degradation might make the correct recognition of findings difficult and consequently influence the diagnostic conclusion. Although there are several studies that assess the efficacy of low-dose CT protocols for various purposes, the evidence that standard-dose CT protocols can be routinely substituted for by low-dose CT is lacking [3–5]. To facilitate the use of low dose chest CT, adequacy of a low dose CT protocol as a routine

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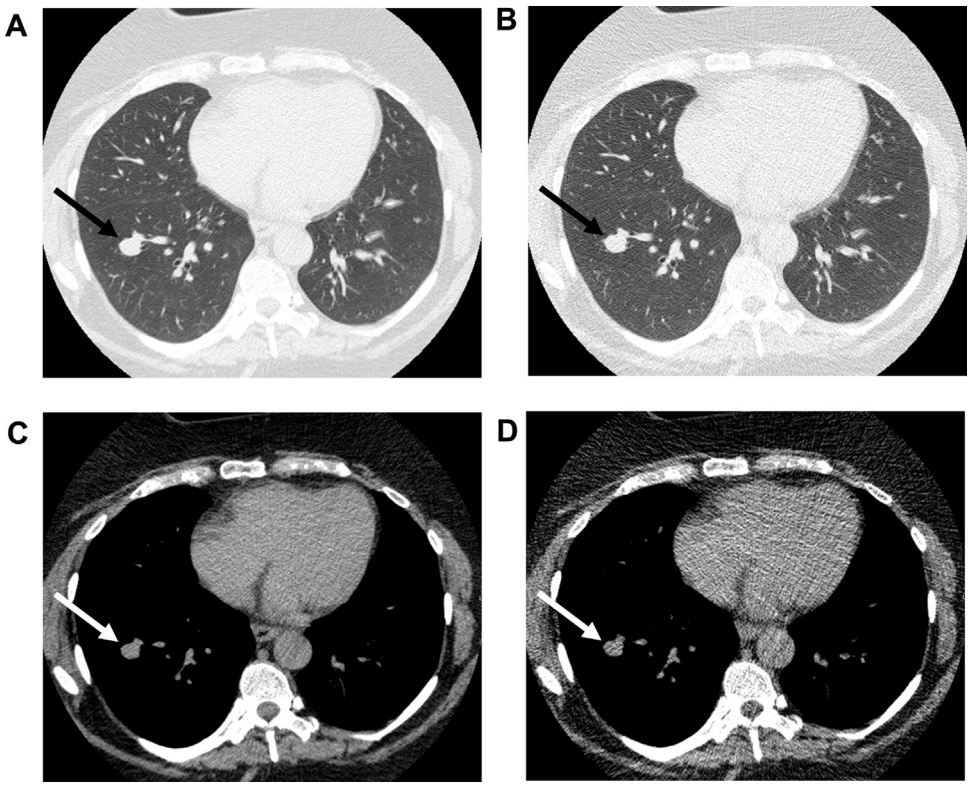

Fig. 1. (a and c, standard dose images; b and d, low dose images) 57 year-old female (body weight 120 kg) who underwent chest CT for a follow-up of solitary pulmonary nodule in the right lower lobe. The nodule appears as an oval smoothly marginated nodule on both standard dose CT image and low dose CT image (arrow).

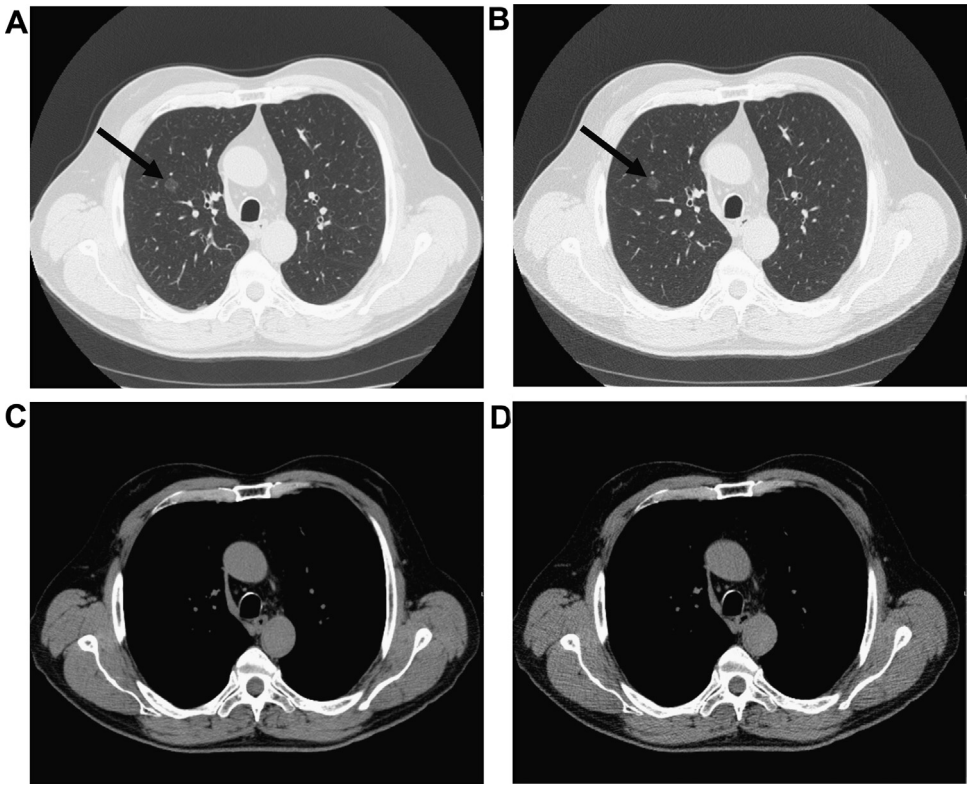

Fig. 2. (a and c, standard dose images; b and d, low dose images) 76 year-old male (body weight 73 kg) who underwent chest CT as a follow-up study for a ground-glass pulmonary nodule. A purely ground-glass nodule in right upper lobe was clearly visualized both with standard dose CT and low dose CT (arrow).