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Research paper

Difference in the craniocaudal gradient of the maximum pixel value change rate between chronic obstructive pulmonary disease patients and normal subjects using sub-mGy dynamic chest radiography with a flat panel detector system

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ABSTRACT

Objectives: To compare the craniocaudal gradients of the maximum pixel value change rate (MPCR) during tidal breathing between chronic obstructive pulmonary disease (COPD) patients and normal subjects using dynamic chest radiography.

Materials and methods: This prospective study was approved by the institutional review board and all participants provided written informed consent. Forty-three COPD patients (mean age, 71.6 ± 8.7 years) and 47 normal subjects (non-smoker healthy volunteers) (mean age, 54.8 ± 9.8 years) underwent sequential chest radiographs during tidal breathing in a standing position using dynamic chest radiography with a flat panel detector system. We evaluated the craniocaudal gradient of MPCR. The results were analyzed using an unpaired *t*-test and the Tukey–Kramer method.

Results: The craniocaudal gradients of MPCR in COPD patients were significantly lower than those in normal subjects (right inspiratory phase, 75.5 ± 48.1 vs. 108.9 ± 42.0 s^{-1} cm^{-1}, $P < 0.001$; right expiratory phase, 66.4 ± 40.6 vs. 89.8 ± 31.6 s^{-1} cm^{-1}, $P = 0.003$; left inspiratory phase, 75.5 ± 48.2 vs. 108.2 ± 47.2 s^{-1} cm^{-1}, $P = 0.002$; left expiratory phase, 60.9 ± 38.2 vs. 84.3 ± 29.5 s^{-1} cm^{-1}, $P = 0.002$). No significant differences in height, weight, or BMI were observed between COPD and normal groups. In the sub-analysis, the gradients in severe COPD patients (global initiative for chronic obstructive lung disease [GOLD] 3 or 4,

Abbreviations: BMI, body mass index; COPD, chronic obstructive pulmonary disease; CT, computed tomography; FEV, forced expiratory volume; FIR, finite impulse response; FPD, flat panel detector; GOLD, global initiative for chronic obstructive pulmonary disease; MPCR, maximum pixel value change rate; MRI, magnetic resonance imaging; SD, standard deviation; VC, vital capacity

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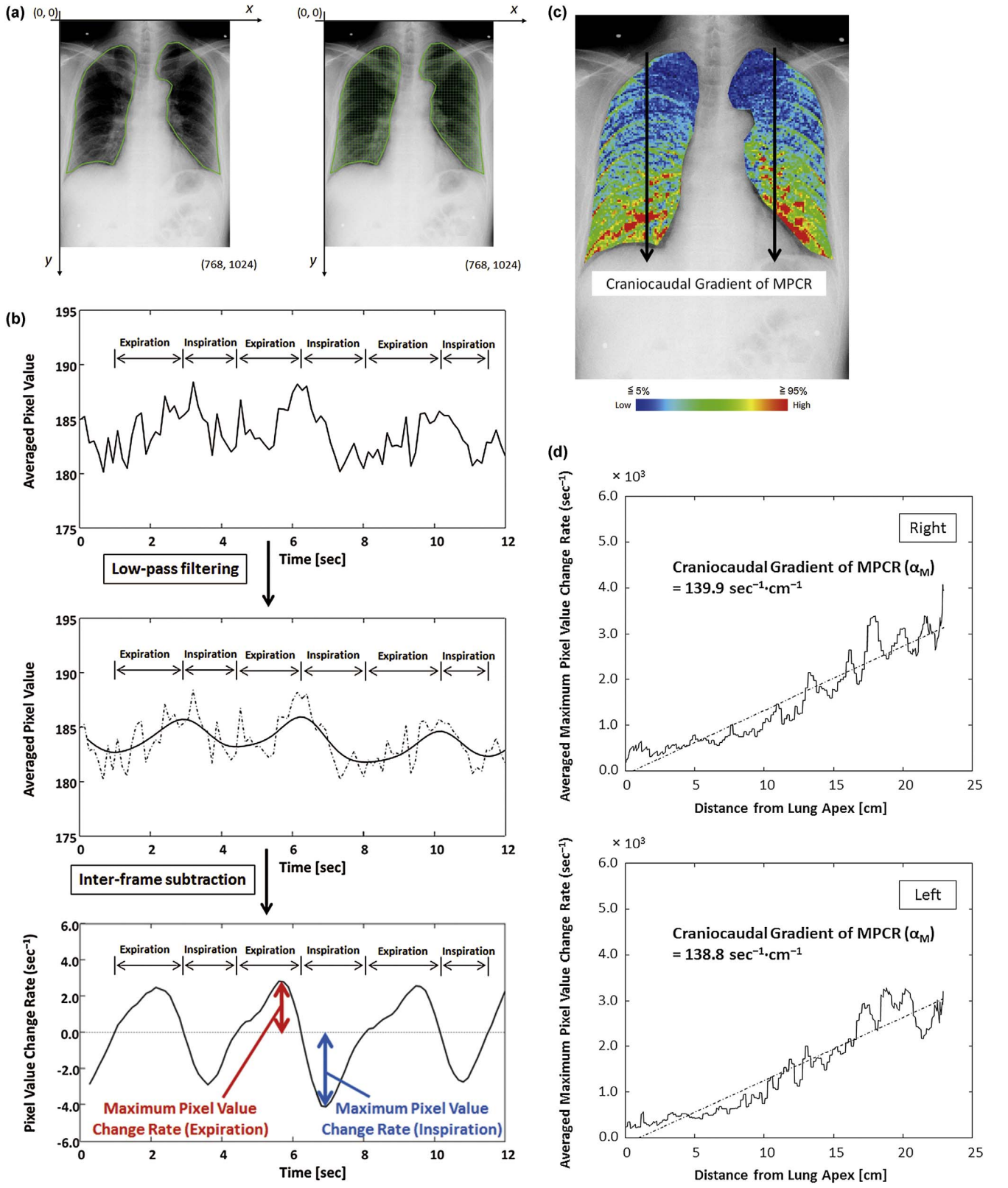
n = 26) were significantly lower than those in mild COPD patients (GOLD 1 or 2, n = 17) for both right and left inspiratory/expiratory phases (all $P \leq 0.005$).
Conclusions: A decrease of the craniocaudal gradient of MPCR was observed in COPD patients. The craniocaudal gradient was lower in severe COPD patients than in mild COPD patients.



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