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Title: Evaluation of spirometric severity in COPD using dynamic chest X-ray examination

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Body: Purpose: Spirometry which requires maximum effort tasks COPD patients. In this study, we purposed another method for evaluation of spirometric severity in COPD using dynamic chest X-ray examination without effort breathing. Subjects: Dynamic chest X-ray from 29 normal volunteers, 13 mild COPD patients (GOLD 1 and 2) and 24 severe COPD patients (GOLD 3 and 4) were obtained in the upright position in about 10 seconds of tidal breathing at rest. The dynamic image data captured at 7.5 frames per second was synchronized with the pulsed X-ray. The institutional review board approval and written informed consent were obtained in all persons. Methods: We calculated the maximum tidal peak flow rate in each ventilation phase at the corresponding small local area of lung in the series of dynamic chest X-ray. And we created the normal template of the maximum tidal peak flow rate from the data of normal volunteers. The regional relative flow rate ratio was obtained from the peak values of inspiratory phase divided by the peak values of expiratory phase. Results: The correlation with the reference distribution of tidal peak flow rate in normal volunteers, in mild COPD and in severe COPD were 0.77 ± 0.13 , 0.69 ± 0.15 and 0.46 ± 0.26 (mean \pm SD), respectively. Significant difference was confirmed between the normal and the mild COPD ($p=0.049$), between the normal and the severe COPD ($p=0.000$) and between the mild COPD and the severe COPD ($p=0.020$), respectively. Conclusion: As significant difference was confirmed between the normal and the mild COPD, a possibility is suggested that early COPD would be detectable with this technique. The new method for ventilation function has possibility to evaluate spirometric severity in COPD.