Classification of Normal Person and Pulmonary Function Disease Patients based on the Respiratory Sound from Trachea

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Abstract
A new auscultation system for the detection of the breath sound from trachea was developed in house, and pulmonary function test results were compared with the parameters extracted from breath sound spectrum. Results showed that the peak frequency and integration value of spectrum revealed the significant differences.

Keywords: breath sound, pulmonary disease, pulmonary function test, power spectrum.

Introduction
Use of auscultation in pulmonary medicine has not theoretically been developed yet, so it calls for the quantitative analysis of the breath sound [1-2]. Previous study for the detection of breath sound from trachea made it possible to perceive approximately constant sound and hardly be affected in the transmission of the sound.

The purpose of this study was to classify normal person and patients who has pulmonary function disease using a system which utilizes a new auscultation methods for the detection and analysis of the breath sound from trachea.

Methods
Figure 1 is a diagram illustrating overall hardware system for the detection of tracheal sound. Sound detector was fabricated by inserting ECM WM-063T microphone to a small cylindrical housing for the resonant effect, which could be positioned comfortably on the neck using strap.

Ten subjects, 5 normal person and 5 pulmonary function disease patients, were participated for the experiment. Pulmonary function tests were performed and the breath sounds were acquired at the sampling frequency of 2048Hz for the duration of 10 seconds using developed system.

Fig. 1. Diagram for the overall hardware system.

Results
Developed breath sound detection system showed the characteristic of frequency response with the band of 90Hz ~ 1600Hz. Figure 2 shows the wave signal of breath sound obtained using developed system and their respective power spectrum for inhaling and exhaling sounds.

Results showed that the parameters, integration value of 100Hz~150Hz and peak frequencies, revealed the significant differences between normal person and patients at p<0.01. But, frequency bandwidth and mean frequencies didn’t show significant differences.

Conclusions
Developed system for detecting breath sound from trachea could be used to distinguish normal person and patients who have pulmonary disease. Extended study could be performed to estimate specific variables in time-frequency domain from breath sound.

References