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# Quantitative Evaluation of the Guided Respiration for Motion Adaptive Radiotherapy

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Targets inside lung or liver usually move significantly due to respiratory motion. A generous margin must be allowed and large volume of normal tissue is irradiated with intensive radiation. Several techniques have been suggested to minimize the PTV relating to respiratory motion. One of methods, adapting radiation fields continuously to a moving target needs information on the location of internal target by detecting it directly or indirectly. In our previous study, each volunteer's representative respiration signal was generated iteratively for guiding signal, and the audio guiding and visual guiding was compared. The purpose of this study is to evaluate the guided breath quantitatively. A system regulates patient's respiration, consists of a ReMM (Respiratory monitoring mask), a thermocouple module, a screen, a inner earphones, and a laptop. ReMM with thermocouple was developed to measure the patient's respiration. A software was written in LabView 7.0 (National Instruments, USA), which acquires respiration signal and display its pattern. Two curves are displayed on the screen: one is a curve indicating patient's current breathing pattern, the other is guiding signal, which is iterated as a real respiration signal. A cycle of representative guiding curves are acquired by monitoring each volunteer's free respiration, then it generated iteratively. Five healthy volunteers are enrolled to regulate their breaths by this system. The time domain of the guided respiratory curves was converted to frequency domain by fourier-transform. The full width half maximum (FWHM) of each respiratory curve in the frequency domain was measured and compared. The smaller FWHM is, the more regulated breath is. The FWHM of breathing curves followed by audio and video guidance were estimated as less than 0.2 /sec, and 0.3 /sec for audio guidance. The discrepancies between guiding curves and breathing curves agreed with 26% and 24% of standard deviation for audio guidance only and for audio and visual guidance, respectively.

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