

AbstractID: 3906 Title: A feasibility study on evaluation of moving phantom for 4D radiotherapy

Purpose: To develop the moving phantom for dosimetric and geometric evaluation of the 4D radiotherapy such as gated radiotherapy, breathing control radiotherapy and tumor tracking.

Method and Materials: This system consisted of the software, the respiration monitoring mask (ReMM) and the moving phantom. Patient's respiration was measured with thermocouple installed in ReMM. The ReMM was connected directly to the operational amplifier. The respiratory signal was digitized by the data acquisition card in the computer. The program, which acquires and records respiratory signal and generates the digital signal to make the phantom simulate respiratory organ motion, was developed. The phantom moved by the servo motor, to which the program sent the digital signal. The respiration of three lung cancer patients, whose organ motion was greater than 5 mm, was monitored through ReMM and fluoroscopy simultaneously. While the phantom simulated patients' organ motion, its motion was monitored by RPM® to verify the effectiveness of the phantom. The discrepancies between the respiration curve and the organ motion and between the respiration and the phantom motion were estimated as standard deviations for each patient to evaluate the moving phantom.

Results: Comparing with the curves of respiration measured by thermocouple and these of the organ motion measured by fluoroscope, the mean standard deviation of discrepancies was 9.68%. The standard deviation of the discrepancy between the respiratory curve and the organ motion was estimated at 8.52%.

Conclusion: The patients did not complain about discomfort with the respiration monitoring mask. The phantom could simulate the organ motion according to the respiratory signal from ReMM. It is expected that the simulating phantom could be used to verify the 4D radiation therapy.