

ANALYSIS ON THE VARIATION OF RESPIRATORY ORGAN MOTION AND A PRELIMINARY FEASIBILITY STUDY FOR A VOICE COACHING TECHNIQUE TO IMPROVE THE REPRODUCIBILITY OF RESPIRATORY CYCLE BETWEEN TREATMENTS

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Purpose : New advances in radiotherapy technology enable us to attain higher dose delivery to tumor region, resulting in greater tumor control probability, with this sophistication there is more demand to control the uncertainties contributed by organ motion. The organ motion related uncertainties can be mainly classified into three main categories: (i) the blurring of planning images due to internal organ motion during CT scan acquisition; (ii) intrafractional organ motion that affect the dose distribution within a single treatment delivery; (iii) interfractional organ motion that affect the dose distribution between treatments.

For patients with supradiaphragmatic and infradiaphragmatic tumor, respiration is a major factor that causes the displacement of the internal organ. For further understanding the magnitude of the respiratory organ motion, we endeavor to investigate: (i) the geometrical differences in spatial displacement of the tumor and critical organ while in free breathing status and breath holding status; (ii) measures the magnitude of the respiratory organ motion in the cranio-caudal direction; (iii) makes a preliminary feasibility study of the coaching breathing technique to improve the reproducibility of the respiratory cycle and hence reduce the variation of organ motion in between treatment.

Materials and Methods : The data were collected between March 2001 to October 2001 in our department from subjects undergoing radiation therapy of the thoracic and abdominal regions using our spiral CT and real time Respiratory Gating system to measure and analyze the variation of respiratory organ motion. A voice coaching technique is designed to improve the consistency of the respiration cycles.

Results and Conclusions : Our analysis shows a significant variation of tumor and organ geometry between free breathing and breath holding state. The cranio-caudal displacement are 15.5 ± 3.5 mm for diaphragm and 13.7 ± 2.4 mm for pancreas, respectively. For patients in our study, coaching technique may improve the reproducibility for those patient whose breathing cycles is not consistent within intrafraction treatment, but not for those with consistent cycles.

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