

AbstractID: 3365 Title: A non-invasive respiratory motion compensation system for predicting organ motion in respiratory-gated radiotherapy of the chest

**Purpose:**

Non-invasive respiratory gated radiotherapy systems, like those based on external anatomic motion, give better comfort to patients than invasive system during treatment. But to treat efficiently, such systems need a higher correlation between the motion of the external and internal anatomy. So we developed the system to track the motion and compensate for the correlation between internal and external anatomy to accurately predict the dynamic position of internal structures such as the diaphragm and tumor.

**Method and Materials:**

The respiratory motion compensation apparatus consists of two image boards, a camera and a fluoroscopy system. The camera and one of the image boards captures the abdominal motion of the patient, while the other image board captures the motion of internal anatomy through the fluoroscopy system. Software interfaced to the camera and fluoroscopy tracks the internal anatomy targets and abdominal surface motion induced by respiration simultaneously, using only image processing without any additional physical markers. The fluoroscopic movie was analyzed to obtain the correlation of internal and external anatomy motion in different parts of the diaphragm, abdominal surface and tumor where possible. Using this correlation coefficient, motion of the internal structures in later sessions was predicted based on the same point of abdominal surface motion.

**Results:**

The range of standard deviations between the predicted positions and the observed positions of some sample structures in each patient was measured about in phase and out of phase respectively. The difference between the predicted and observed positions of the abdominal surface, diaphragm or tumor was reduced a maximum 10 mms under the out of phase to 2mms under the in phase.

**Conclusion:**

This non-invasive respiratory motion compensation system accurately predicts the respiratory motion of internal structures within 2 mms. Thus, this may improve the accuracy of gated or conventional 3D conformal radiotherapy.