

Purpose:To examine and quantify the chest wall motion for patients under EBRT for chest wall lesions using 4D-CT, determine the necessity of 4D-CT simulation for planning; and evaluate the requirement of respiration gated treatment for chest wall treatments.

Methods:4D-CT is currently performed for all chest wall/breast patients in our clinic to assess the motion of the target volume for EBRT treatment. GE LightSpeed® 16-Slice scanner and Varian PRM® system are combined to acquire the images, with the infrared reflector placed on patient's abdominal region where the most up-and-down motion is found. Patients are setup in supine position, with Wingboard® and Vac-Bag® for immobilization. The raw 4D images were binned into ten phases (0-90%) using GE advantage 4D® application and then transferred to MIM Vista® for reviewing. To determine the largest shift of the chest wall/breast during a respiratory cycle, the highest point (on patient's skin) among all phases was selected. Then the distance between its highest and lowest position among all phases was recorded.

Results:Ten chest wall/breast patients were initially selected. The average maximum shift was 0.18 cm, which is insignificant amount of movement even for IMRT treatment. Eight (five of which are male) lung tumor patients (with similar simulation setup) were added to the study, the focus was still on the motion of the chest wall/breast region (not treatment volume). The average maximum shift was 0.23 cm for all eighteen patients.

Conclusions:It is believed that the patient's setup in this study greatly increases the diaphragmatic breathing. As a result, the chest wall/breast motion was found to be negligible in view of combined uncertainty of mechanical alignment and clinically relevant accuracy. Utilizing 4D-CT for treatment planning and respiration-gating for chest wall treatment seems unnecessary.