

AbstractID: 5230 Title: Accuracy and dosimetric advantage of target localization using stereoscopic image-guided radiotherapy for lung cancer treatment

**Purpose:** We analyzed the accuracy of stereoscopic image-guided radiotherapy (S-IGRT) with the ExacTrac® system (BrainLAB AG, Heimstetten, Germany), and demonstrated the dosimetric advantage for lung cancer treatment.

**Methods:** The accuracy of target localization using the ExacTrac system was analyzed by re-scanning ten patients immobilized in the Vac-loc bag with BB tags put on the isocenter marks determined by the ExacTrac system. The re-scanned CT data from each patient was fused and compared to the isocenter locations on the original CT used for the treatment planning. The Active Breathing Coordinator™ (Elekta, Norcross, GA) was employed to minimize the breathing motion effect on S-IGRT. The dosimetric advantage of S-IGRT was demonstrated by comparing the normal lung volume receiving 15%, 30% and 50% of the prescription dose ( $V_{15\%}$ ,  $V_{30\%}$  and  $V_{50\%}$ ) between the plans with smaller margins in the S-IGRT and those with normal margins in the conventional radiotherapy for the ten patients.

**Results:** The average isocenter shifts using S-IGRT were within  $3.4 \pm 1.7$ mm in the lateral,  $3.6 \pm 1.9$ mm in the anterior/posterior, and  $2.2 \pm 3.2$ mm in the superior/inferior directions. The added margins around the CTV to create the PTV were chosen to be 10mm in the superior/inferior and 5mm in radial direction for the lung cancer treatment planning in S-IGRT. For the ten patients with CTV volume from  $8.3\text{cm}^3$  to  $43.4\text{cm}^3$  and lung volume from  $2736\text{cm}^3$  to  $3640\text{cm}^3$ , the averages of  $V_{15\%}$ ,  $V_{30\%}$  and  $V_{50\%}$  were 17.4%, 9.8%, 5.9% for the S-IGRT plans, and 33.4%, 18.2%, 12.8% for the conventional radiotherapy plans with 2cm margins in the all directions.

**Conclusion:** The S-IGRT with the ExacTrac system provided highly accurate tumor localization. The margins from CTV to PTV in S-IGRT treatment planning could be reduced significantly due to the accurate target localization which will reduce the lung volume receiving doses in the medium and low ranges.