AbstractID: 9033 Title: Setup errors using daily CT for image guided extracranial stereotactic body radiation therapy

**Purpose:** To estimate setup errors using daily CT for image guided extracranial stereotactic body radiation therapy (SBRT).

**Methods and Materials:** Five patients undergoing SBRT of lung cancers were retrospectively considered. Prior to each treatment, patients were re-scanned in the simulation room. These CT images, named control CT (CCT), were registered with the planning CT to calculate daily offsets from the initial marker-based setup. This was done in two steps: first, bony structure based rigid registration was performed, which mimicked patient setup using fiducial markers; second, deformable registration was performed which would capture daily tumor shifts with respect to bony structures. After registration tumor contours were mapped from the simulation CT to CCT using the translation fields obtained from both rigid and deformable registrations. The center of mass of both mapped contours was calculated. Their difference would be the offset to be applied to the patients after patients being aligned using fiducial markers. To estimate the accuracy of CCT based patient setup, after marker-based patient setup in the treatment room, each patient was scanned again using CBCT. The CBCT image was also registered to the planning CT using the same two step registration. Similarly, CBCT based patient offset was also calculated. Finally the difference between these two offsets was calculated for each patient.

**Results:** The mean of the absolute offset difference was on average 1.8±1.5 mm, 1.0±0.8 mm and 2.3±1.8 mm in the left-right (LR), anterior-posterior (AP) and superior-inferior (SI) directions respectively. The corresponding p-values between these two alignment methods were 0.07, 0.76, and 0.89 in the LR, AP and SI directions respectively.

**Conclusions:** Patient alignment using daily CT agreed well with the alignment using CBCT. The difference was statistically indistinguishable. Alignment using daily CT provides a solution for image guided radiation therapy on facilities without the on-board imaging capability.