

AbstractID: 7087 Title: Amplitude Gated Breath-Hold Treatment for Upper Abdominal Lesions with On Board Imaging Guidance

Purpose: To apply on-board-image (OBI) guided amplitude gating for breath-hold treatment and to assess treatment margin adequacy by analyzing the isocenter placement based on orthogonal 2D kV radiographs and 3D cone-beam CT (CBCT) acquired under amplitude-gated breath-hold.

Method and Materials: 25 patients with liver, pancreas, bile duct, or adrenal lesions were treated by using amplitude-gated breath-hold technique during the last 18 months. 2D orthogonal kV and 3D CBCT images were acquired under amplitude-gated breath-hold and matched to the corresponding DRRs and planning CT images, respectively, for isocenter placement. A total of 438 sets of 2D kV images and 70 sets of CBCT images were analyzed. The margin of 95% probability, which warrants that the target will be within the treatment fields with a probability of 95%, was used to quantify the margin reduction of using image-guidance for the breath-hold treatment.

Results: The average isocenter shifts based on 2D kV OBI matching over the breath-hold laser alignment were 0.31 ± 0.27 cm, 0.28 ± 0.28 cm and 0.29 ± 0.28 cm along the lateral (LR), longitudinal (SI) and vertical (AP) directions, respectively. After the patients were moved to the isocenter based on 2D images, the additional shifts based on 3D CT-CBCT matching were 0.28 ± 0.28 cm, 0.30 ± 0.37 cm and 0.32 ± 0.27 cm along LR, SI, and AP directions, respectively. The 95% probability margins of daily 2D OBI matching with respect to the 3D CBCT matching were 0.6 cm, 1 cm and 0.9 cm along LR, SI and AP directions. If image guidance technique was not used, the required margins of 95% probability increased to 1.1, 1.3 and 1.2 cm along the LR, SI and AP directions.

Conclusion: Amplitude gated breath-hold technique is useful for the treatment of upper abdominal lesions. Image-guidance technique substantially reduced treatment margin.