

Purpose: To evaluate patients Dose Volume Histogram (DVH) parameters in cumulative healthy liver dose using four-dimensional computed tomography (4DCT) image and active breathing control (ABC) manner.

Methods: Ten liver cancer patients were analysed retrospectively. The static plan was designed on reference CT image from the free breathing status scanning and the organ at risk (OAR) dose were evaluated. The tracking accumulative dose were calculated on 10 different breathing phases of 4DCT based on relative time weight. The mean healthy liver dose were calculated in different exhale and inhale breath hold using ABC technology. Three motion management strategies plans were compared and analysed.

Results: The maximum difference of mean healthy liver dose in 4DCT image was 9.5% between phase 10 and phase 60. The largest absolute dose in mean healthy liver was 5.05Gy between the tracking dose and the deep inhale breath hold ($P=0.05$). The difference using ABC between the deep inhale and exhale breath hold was maximum 1.45Gy and no significance was observed between the calm inhale and exhale breath hold. Also there was no significance between the target tracking and any breath phase in 4DCT image.

Conclusions: The target tracking dose was the actual delivered dose to the patient. The difference in breath hold and the target tracking dose was significantly. Therefore, We suggest the deep inhale breath hold was used in the liver radiotherapy treatment using ABC technology. However, we needed more patients to further study to get the more accurate result.