Purpose: To investigate the difference in sparing normal liver tissue between 4D-CT and active breathing coordinator (ABC) in the radiotherapy of Hepatocellular carcinoma (HCC) applying RapidArc.

Methods: Ten patients with HCC underwent 3D-CT at end inspiration hold (EIH) associated with active breathing coordinator (ABC), and 4D-CT scan. The 4D-CT images were sorted into 10 serious CT images according to respiratory phase. Gross tumor volumes (GTVs) were manually contoured on different CT images. The individual internal gross target volume (IGTV) was obtained from 10 GTVs of 4D-CT images. Plan target volumes (PTVs) were obtained based on IGTV and GTVEIH. PTV1 was obtained from IGTV plus 5 mm margins isotropically, and PTV2 was obtained from GTVEIH using 8 mm margins isotropically. RapidArc plans were designed on PTV1 and PTV2, for PTV1 RapidArc plans with one single whole arc were applied and for PTV2 three 135° arcs, and name RapidArc1 and RapidArc2. Dosimetric differences were compared.

Results: There were no significant difference in conformity index (0.93±0.05 Vs 0.93±0.03), homogeneity index (1.08±0.01 Vs 1.08±0.01), the D1% (54.44±0.36 Gy Vs 54.68±0.47 Gy) and D99% (49.18±0.48 Gy Vs 49.00±0.34 Gy) between RapidArc1 and RapidArc2 (P>0.05). There were no significant differences in the mean dose (8.23±1.5 Gy Vs 7.63±3.0 Gy), V5 (46.64±19.31 Vs 43.29±19.94), V10 (28.73±11.54 Vs 28.23±12.37), V15 (17.87±6.61 Vs 18.20±7.55), V20 (11.62±4.39 Vs 11.83±4.58), V25 (7.71±2.91 Vs 7.58±2.79), V30 (5.14±2.01 Vs 5.05±1.79), V35 (3.41±1.35 Vs 3.35±1.21) and V40 (2.12±0.86 Vs 2.06±0.75) between RapidArc1 and RapidArc2 (P>0.05).

Conclusions: The RapidArc plans with three 135° arcs associated could achieve similar dose delivery as the plans with single whole arc, and 4D-CT and ABC could play similar role in sparing normal liver tissue assuring the accuracy of target volume in radiotherapy of HCC.