

STUDY ON THE DOSE EVALUATION VARIATION OF LEFT VENTRICULAR MYOCARDIAL AND LEFT ANTERIOR DESCENDING INDUCED BY HEARTBEAT IN LEFT BREAST CARCINOMA RADIOTHERAPY

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Purpose: To study the dose evaluation variation of left ventricular myocardial (mLV) and left anterior descending (LAD) induced by heartbeat in intensity modulated radiotherapy (IMRT) of left breast carcinoma.

Methods: 15 female patients were enrolled. All the patients received electrocardiography gated 4D-CT scan in inspiration breath hold, and CT images were sorted into 20 phases (0%, 5%.....90%, 95%) according to cardiac cycle. Then, the mLV and LAD were delineated slice by slice, and the left breast carcinoma IMRT plans were designed on 0% phase CT images. The volume and dice similarity coefficient (DSC) of mLV were calculated, and the V10, V20, V30, V40 and Dmean of LAD and mLV were compared among different phases.

Results: (1) The average rate of DSC variation of mLV was eightfold of volume, which reached to 472.07% with statistically significant difference ($P < 0.001$). (2) The average rate of variation of mLV Dmean was $(18.74 \pm 9.32)\%$, up to 41.95% and the difference was statistically significant ($P < 0.001$); the variation range of V10, V20, V30 and V40 of mLV were $(10.06 \pm 9.21)\%$, $(9.24 \pm 9.63)\%$, $(8.45 \pm 9.66)\%$ and $(6.86 \pm 10.00)\%$, and the difference was statistically significant ($P < 0.05$). (3) The average rate of variation of LAD Dmean was $(58.88 \pm 29.10)\%$, up to 130.14%, and the difference was statistically significant ($P = 0.001$); the variation range of V10, V20, V30 and V40 of LAD were $(28.52 \pm 12.11)\%$, $(29.35 \pm 12.65)\%$, $(28.84 \pm 13.74)\%$ and $(26.35 \pm 15.89)\%$, and the difference was statistically significant ($P < 0.001$).

Conclusion: The dose evaluation variation of mLV and LAD which were induced by heartbeat should not be ignored. Our study provided a reference for the accurate prediction of cardiac toxicity, and that could benefit to protection of heart and cardiac sub-structure.

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