

Perfusion Computed Tomography: A Non-invasive Technique to Early Evaluating the Therapeutic Effect of Radiotherapy for Primary Hepatic Cancer

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Abstract – Purpose: This study aims to investigate the quantitative metrics derived from perfusion computed tomography imaging for early evaluating the therapeutic effect of radiotherapy for primary hepatic cancer (PHC).

Methods and Materials: A total of thirty-one patients with single histologically proven PHC. All patients were examined with CT-perfusion technique pre-(1 d before radiotherapy) and post- treatment (1d after radiotherapy). The third and the fourth conventional contrast-enhance CT would be carried out in one month, two later for evaluating the response of radiotherapy according to Response Evaluation Criteria in Solid Tumors. Data were analyzed using a dedicated software which generated a parameters, assessed hepatic blood flow (HBF), hepatic blood volume (HBV), mean transit time (MIT), and permeability surface area product (PS), hepatic arterial index (HAI), hepatic artery perfusion (HAP), and portal vein perfusion (PVP). Compared the quantitative index with regress ratio of tumor, found out which one can early reflect the therapeutic effect of radiotherapy.

Results: In all patients, no stable disease cases were found. All of the patients were divided into two groups: PR+CR groups and PD groups. In the PR+CR group, the changes of hepatic artery perfusion (HAP), hepatic arterial indexes (HAI) of tumors were correlated with regress ratio of tumors ($P = 0.001, 0.049$, respectively). In the PD group, only the changes hepatic arterial indexes (HAI) of the tumors were significantly correlated with post-radiotherapy ($P = 0.029$). No significantly statistic difference were found in the changes of HBV, HBF, MIT, PVP and PS. The alteration of HAI during the process of radiotherapy can early and sensitively reflect the effective of radiotherapy.

Conclusions: Our data suggest that a decrease in available hepatic artery blood during the early course of radiotherapy is associated with local control, perfusion CT imaging can early provide quantitative information about radiotherapy effective of primary hepatic cancer. But the standards for image acquisition, parameter quantification methods, QA/QC systems and statistical metrics should be developed before we use the current results properly.

Figure 3

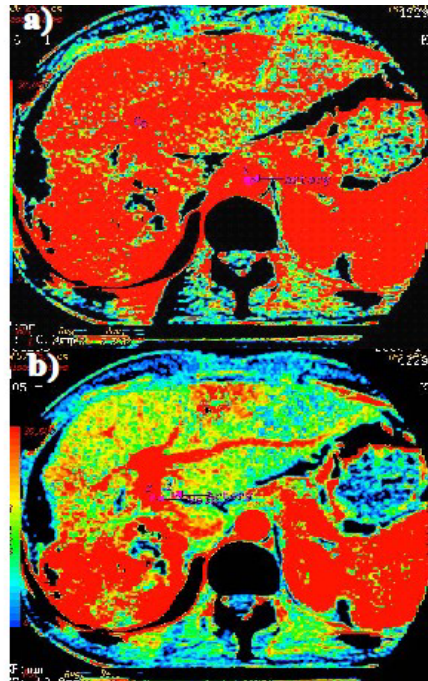


Fig. 3 CT Perfusion images.

A 46-year- man with HCC verified with treatment response of PR.

(a) show the blood supply of right liver before radiotherapy.

(b) Post-radiotherapy map showing a significant decrease of HAP in the viable tumor