

A correlation of computed tomography perfusion and histopathology in tumor edges of hepatocellular carcinoma

Rong-Jie Bai, Jin-Ping Li, Shao-Hua Ren, Hui-Jie Jiang, Xin-Ding Liu, Zai-Sheng Ling,
Qi Huang and Guang-Long Feng

Harbin, China

BACKGROUND: The peripheral morphologic characteristics of hepatocellular carcinoma (HCC) reflect tumor growth patterns. Computed tomography (CT) perfusion is a new method to analyze hemodynamic changes in tissues. We assessed the relationship between CT perfusion and histopathologic findings in the periphery of HCC lesions.

METHODS: Non-contrast CT, enhanced dual-phase CT, and CT perfusion were performed on 77 subjects (47 patients and 30 controls). Based on the imaging findings of enhanced dual-phase CT, the tumor edges were classified into three types: type I (sharp); type II (blurry); and type III (mixed). The CT perfusion parameters included hepatic blood flow, hepatic arterial fraction, hepatic arterial perfusion, and hepatic portal perfusion. The tissue sections from resected specimens were subjected to routine hematoxylin and eosin staining and immunohistochemical staining for CD34. The correlations between microvessel density (MVD) and the CT perfusion parameters were analyzed using Pearson's product-moment correlation coefficient. Changes in the perfusion parameters in tumor edges of different tumor types were evaluated.

RESULTS: Type I (sharp): the pathologic findings showed fibrous connective tissue capsules in the tumor edges, and an MVD $\leq 30/\text{mm}^2$. Type II (blurry): the histology showed that the edges were clear with no capsules and an MVD $>30/\text{mm}^2$. Type III

(mixed): the pathology was similar to that of types I and II, and an MVD $>30/\text{mm}^2$. Hepatic blood flow, hepatic arterial fraction, hepatic arterial perfusion, and hepatic portal perfusion were significantly increased in the tumor edges of HCC patients compared to those of the controls ($P < 0.05$). The correlation between CT perfusion parameters and MVD was higher in blurry tumor edges of type II than in those of types I or III.

CONCLUSION: CT perfusion imaging of tumor edges may be helpful in revealing histopathological features, and indirectly reflect angiogenic changes of HCCs.

(*Hepatobiliary Pancreat Dis Int* 2014;00:000-000)

KEY WORDS: hepatocellular carcinoma;
tumor edge;
computed tomography;
X-ray computer;
histopathology;
perfusion imaging

Introduction

The morphologic characteristics of hepatocellular carcinoma (HCC) can not only predict the biological behavior of the tumor, but also determine the effect of treatment. New insight into angiogenesis, especially at the edges between tumors and normal tissues, can provide information that can be used in selecting treatments.^[1, 2] Studies on HCC showed that HCC edges are the most active area of angiogenesis.^[3-6] Angiogenesis plays an important role in tumor growth and development and in tumor invasion and metastasis.^[7-9] Thus, it is important to understand tumor angiogenesis in tumor edges and to improve the radiologic assessment. Currently, the evaluation of the morphologic characteristics of tumor edges mainly relies on conventional ultrasonography, MRI and CT scanning, but the evaluation of angiogenesis

Author Affiliations: Department of Radiology, Beijing Jishuitan Hospital, the Fourth Clinical Medical College of Peking University, Beijing 100035, China (Bai RJ); Department of Radiology, Second Affiliated Hospital, Harbin Medical University, Harbin 150086, China (Li JP, Jiang HJ, Liu XD, Ling ZS and Feng GL); Department of Radiology, the First Hospital of Harbin, Harbin 150010, China (Ren SH); and Department of Pathology, Harbin Medical University, Harbin 150086, China (Huang Q)

Corresponding Author: Hui-Jie Jiang, MD, PhD, Department of Radiology, Second Affiliated Hospital, Harbin Medical University, Harbin 150086, China (Tel: +86-451-86605576; Email: jhjemail@163.com)

© 2014, Hepatobiliary Pancreat Dis Int. All rights reserved.
doi: 10.1016/S1499-3872(14)60298-8
Published online October 27, 2014.