

Assessment of Neoplastic Angiogenesis Using Perfusion-Weighted MR Imaging: Experimental Study in Hepatic VX2 Carcinoma in Rabbits

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Purpose: To evaluate the perfusion-weighted MR imaging findings of hepatic VX2 carcinoma in rabbits and to explain the perfusion characteristics of hepatic VX2 carcinoma by correlation with histopathology.

Materials and Methods: Twelve New Zealand White rabbits, each weighing between 2.5 and 3.5 kg (mean, 3.1 kg), were studied. MRI was performed 7-21 days after injection of tumor cell suspension into the hepatic parenchyma by laparotomy. Perfusion-weighted MRI was performed using single-shot gradient echo echoplanar imaging(EPI). On the basis of calculated enhancement ratio, the time-intensity perfusion curve for VX2 tumor and normal liver was created. For histopathologic explanation, we performed immunohistochemical study, in which microvessel density was assessed by staining of their endothelial cells for factor VIII-related antigen.

Results: The time-intensity perfusion curve showed rapid decrement of signal intensity of VX2 carcinoma at early perfusion phase and immediate recovery after the signal intensity was maximally decreased. In contrast to the VX2 carcinoma, the time intensity perfusion curve obtained in normal liver parenchyma showed slower decrement of signal intensity at late perfusion phase and gradual recovery. This characteristic perfusion pattern was constantly observed in all cases. The time at which maximum signal intensity decrease was observed is 12-14 sec (mean, 13 sec) in VX2 carcinoma and 30 sec in normal liver. The maximum enhancement ratio of VX2 carcinoma and normal liver ranged from 35 to 50% (mean 40%) and from 20 to 40% (mean, 30%), respectively. On pathologic examination, numerous neo-microvessels were observed within the stroma of VX2 tumors. The MVD of VX2 carcinoma was significantly greater than normal hepatic parenchyma($p < 0.05$).

Conclusion: The constant perfusion characteristic of hepatic VX2 carcinoma in rabbits was observed on the perfusion-weighted MR imaging and histopathology confirmed that was due to the angiogenesis of malignant hepatic tumor.

Perfusion-weighted MR imaging was useful diagnostic tool that could reflect the neoplastic angiogenesis and is expected to have promising diagnostic uses for differentiating liver tumor in the future.