CT Detection of Hepatocellular Carcinoma in Advanced Liver Cirrhosis: Correlation of Helical CT and Explanted Liver

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Abstract

Objective: The objective of this study was evaluate the diagnostic efficacy of three-phase helical dynamic CT in the detection of hepatocellular carcinomas in patients with advanced liver cirrhosis. Materials and Methods: Three-phase helical dynamic CT in 77 patients with advanced liver cirrhosis was evaluated prospectively before orthotopic liver transplantation. The histopathologically confirmed hepatocellular carcinomas in the explanted livers were compared with pretransplantation CT results by one-to-one correlation. Results: Histopathologic examination of the explanted livers revealed 72 hepatocellular carcinomas in 41 patients. The size of the hepatocellular carcinomas was 0.5–14.0 cm (mean, 1.6 cm). The use of helical dynamic CT enabled the detection of 38 of 72 hepatocellular carcinomas (sensitivity, 53%). Fifteen of 35 (43%) hepatocellular carcinomas smaller than 2 cm and 23 of 37 (62%), hepatocellular carcinomas ranging from 2.0 cm to 14.0 cm were detected. Patient sensitivity and specificity in the detection of hepatocellular carcinoma were 81% (33/41) and 94% (34/36), respectively. Conclusions: Three-phase helical dynamic CT is insensitive for detection of hepatocellular carcinomas in patients with advanced liver cirrhosis, especially for hepatocellular carcinomas smaller than 2 cm. (Korean J Hepatol 2002;8:201–208)

Introduction

Hepatocellular carcinoma is one of the most common malignant tumors worldwide and the incidence is ever increasing. Although the tumor was considered a highly malignant tumor, the prognosis has been improving recently. It is because the tumor can be detected in earlier stage as a result of the recent advances in imaging methods which are being used as a screening programs in patients with chronic liver disease. Furthermore, the tumor can be treated effectively by resection surgery, local treatment such as alcohol injection and radiofrequency ablation therapy, transcatheter arterial embolization, or liver transplantation, depending upon the size and number of tumors as well the reserve function of the liver. Therefore, early detection of a small tumor and accurate detection is utmost important.

CT has been used as one of the standard methods for detecting and characterizing

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hepatocellular carcinoma\textsuperscript{1} and it gives information about the extent of primary tumor, lymph node metastasis, peritoneal seeding, bone and lung metastasis as well. In patients with chronic liver disease, CT gives the information about the functional liver volume, topographical anatomic information and clinical stage of portal hypertension. Therefore, CT is the gold-standard in the detection of hepatic tumor as well as presurgical evaluation for candidates for liver resection surgery or transplantation.

Multiphasic dynamic CT scanning is one of the standard in the detection of hepatocellular carcinoma.\textsuperscript{1-4} Recent studies showed that the sensitivity was 88–94\% and specificity was 96–99\%.\textsuperscript{5-8} However, this high accuracy was based on the patients with relatively good liver function reservoir who underwent surgery. On the other hand, the detectability of hepatocellular carcinoma in patients who underwent liver transplantation is 71–76\%.\textsuperscript{3,10} This implies that detection of hepatocellular carcinoma becomes difficult as the liver cirrhosis becomes advanced. Innumerable macronodular cirrhotic nodules, increased fibrosis, massive fibrosis, nodular surface, arteriportal shunts, distorted anatomy and the shrinkage of the liver make it difficult to detect small or infiltrating hepatocellular carcinoma.\textsuperscript{11} This is a prospective study in order to evaluate the diagnostic efficacy of three-phase helical CT in the detection of hepatocellular carcinoma in patients with advanced stage of liver cirrhosis before liver transplantation.

Materials and Methods

Patients

From February 1998 to April 2002, a total of 108 consecutive adult patients underwent whole liver transplantation at our institution. Among them, 77 patients had three-phase helical dynamic CT for the evaluation of the liver in terms of hepatic anatomy and liver volume as well as detection of tumor before transplantation, and this group formed the basis of our study. The other 31 patients who had conventional CT at outside hospitals using third-generation scanners were excluded from the analysis. Sixty-eight patients were proven to have liver cirrhosis associated with hepatitis B, four patients had liver cirrhosis associated with hepatitis C, one patient had drug induced hepatitis, one patient had primary sclerosing cholangitis and three patients had cryptogenic liver cirrhosis. All patients underwent triple-phase helical dynamic CT scanning with a large dose bolus injection of contrast material prior to surgery. The time interval between CT examination and surgery was 0–76 days (mean, 27.3 days). There were 65 men and 12 women, and their ages ranged from 18 to 62 years (mean, 42 years).

Three-Phase Helical Dynamic CT

Three-phase helical scanning was performed in all of the 77 patients using HiSpeed Advantage helical scanners (General Electric Medical Systems, Milwaukee, WI). The scans were obtained through the liver in a craniocaudal direction with 7-mm collimation: with a 7-mm/sec table speed (pitch, 1.0) during a single breath-hold helical acquisition of 25–30 sec, depending upon the size of the liver; and with a 7-mm reconstruction interval. For the three-phase CT scanning, the hepatic arterial phase, portal venous phase, and delayed phase were scanned 30 sec, 60 sec, and 180 sec, respectively, after the start of the injection of 120 mL of non-ionic iodinated contrast materials, iopamidol