

CT arterial portography and CT hepatic arteriography in detection of micro liver cancer

LI Li, WU Pei-Hong, MO Yun-Xian, LIN Hao-Gao, ZHENG Lie, LI Jin-Qing, LU Li-Xia, RUAN Chao-Mei and CHEN Lin

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Abstract

AIM To recognize the characteristic findings of micro-liver cancer (MLC) and to evaluate the effect of CT arterial portography (CTAP) and CT hepatic arteriography (CTHA) in diagnosis of MLC.

METHODS Between April 1996 to December 1998, CTAP and CTHA were performed in 12 patients with MLC, which were not detected by conventional CT examinations. After CTHA, 3 mL-5 mL mixture of lipiodol, doxorubicin and mitoycin C were injected into hepatic artery through the catheter, and the followed up by CT three or four weeks later (Lipiodol CT Lp-CT).

RESULTS A total of 22 micro-tumors (0.2 cm-0.6 cm in diameter) were detected in 12 patients, which manifested as small perfusion defects in CTAP and small round enhancement in CTHA. The rate of detectability of CTAP and CTHA was 68.2% (15/22) and 77.3% (17/22) respectively, and the rate of the simultaneous use of both procedures reached 86.4% (19/22). All micro-tumors were demonstrated as punctate lipiodol deposit foci in Lp-CT. After Lp-CT, the elevated serum level of α -fetoprotein (AFP) dropped to the normal level in all patients.

CONCLUSION The CTAP and CTHA are the most sensitive imaging methods for detecting micro-liver cancer. Confirmed by the change of the elevated serum AFP level and lipiodol deposit foci in Lp-CT, small perfusion defects in CTAP and punctate enhancement in CTHA may suggest micro-liver cancer.

Cancer Center, Sun Yat-Sen University of Medical Sciences, Guangzhou 510060, Guangdong Province, China

Dr. LI Li, male, born on 1968-10-08 in Changsha City, Hunan Province, graduated from Sun Yat-Sen University of Medical Sciences as a postgraduate in 1996, now attending doctor of medical imaging, majoring oncological imaging diagnosis and interventional radiology, having 8 papers published.

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Correspondence to: Dr. LI Li, Department of Imaging & Interventional Radiology, Cancer Center, Sun Yat-Sen University of Medical Sciences, 651 Dongfeng Road E, Guangzhou 510060, Guangdong Province, China

Tel. +86 • 20 • 87765368 Ext 3216, Fax. +86 • 20 • 87754506

Email. Liliixj@public.guangzhou.gd.cn

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INTRODUCTION

With combined the findings of diagnostic imaging and elevated serum AFP level, more and more small liver cancer were detected earlier, and the therapeutic effect was significantly improved^[1,2]. Except for other causes, such as hepatitis and teratoma, the elevated serum AFP level (higher than 400 μ g/L) strongly suggests the occurrence of primary hepatocellular carcinoma. However, sometimes no tumors could be found on conventional CT scanning (contrast material administered by intra-venous injection). These patients were further examined with were CTAP and CTHA. From April 1996 to December 1998, 12 patients with micro-cancer were examined with CTAP and CTHA in our hospital.

MATERIALS AND METHODS

Materials

From April 1996 to December 1998, 12 patients (10 men, 2 women) suspected to have liver cancer were examined with CTAP and CTHA. They ranged in age from 23 to 54 years (mean age, 36.4 years). The serum level of AFP was elevated in all the patients with a range of 201 μ g/L to 1 405 μ g/L (including 8 cases > 400 μ g/L, 4 cases < 400 μ g/L). Cirrhosis occurred in 7 cases. The tumors were 0.2 cm-0.6 cm in size with a mean of 0.46 cm. Multiple nodules were found in 7 cases.

Methods

CTAP examinations were performed with incremental scanning of the liver in cranial-to-caudal direction with 2.7 mm to 8 mm collimation on bi-spiral-*Elscint* Twin Flash scanner (*Elscint*-Corp.). CT images were obtained 25sec-35sec after the initiation of transcatheter (5-F) superior mesenteric artery injection of 30 mL-40 mL of non-ionic contrast medium at a rate of 2.5 mL/sec-3.0 mL/sec with an automatic power injector (Medrad, Pittsburgh). During the catheterization, contrast medium administered before CT scanning was limited to 5 mL-10 mL injected by hand to visualize any aberrant vessels and to facilitate proper catheter placement.

CTHA examinations were done by injecting contrast medium into proper hepatic artery or

common hepatic artery. Twenty mL to 30 mL of contrast medium was injected at a rate of 3.0 mL/sec-3.5 mL/sec. Consecutive scanning of the liver was started 6sec-8sec after the initiation of injection of the contrast medium. After CTHA examinations, 3 mL-5 mL mixture of lipiodol, doxorubicin (10 mg-15 mg), and mitoycin C (2 mg-4 mg) were injected into hepatic artery, and the follow-up CT was performed three or four weeks later (Lp-CT). The serum AFP level was detected in all the patients two or three weeks later, and all returned to normal within 1-6 months.

RESULTS

Detectable rate of micro-tumors

A total of 22 micro-tumors were found in our group. The tumors measured 0.2 cm-0.6 cm with a mean of 0.46 cm. CTAP and CTHA images were carefully interpreted by two experienced radiologists. Fifteen tumors were demonstrated as fleckly perfusion defects on CTAP images with a detectable rate of 68.2%, and 17 manifested as punctate enhancement foci on CTHA with a detectable rate of 77.3%. Nineteen were found by simultaneous use of both procedures with a detectable rate of 84.4%. But 3 tumors were not detected by CTAP and CTHA in 2 patients. All 22 micro-tumors manifested as punctate lipiodol deposit foci in Lp-CT, which was performed two or three weeks later. Because the tumors in our series were extremely small, no pathologic diagnosis was acquired in all patients.

Follow-up of patients

The serum AFP level was examined two or three weeks after Lp-CT. The AFP level dropped to the normal level in all the patients. Within 1-6 months. All survived without any signs of recurrence in our group, and the survival period ranged from 3 to 33 months (mean, 15.2 months).



Figure 1 CTAP image obtained in a 40-year-old man with liver micro-cancer shows a punctuate perfusion defect in right lobe.

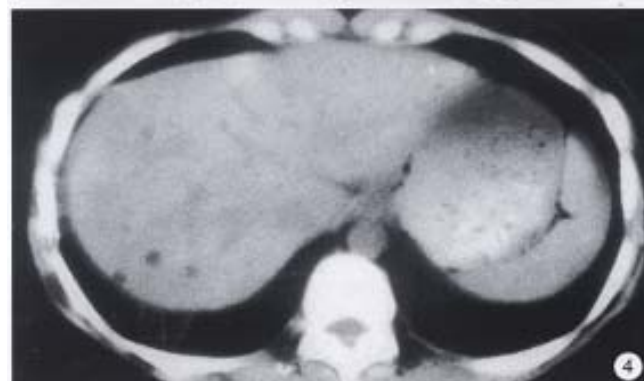
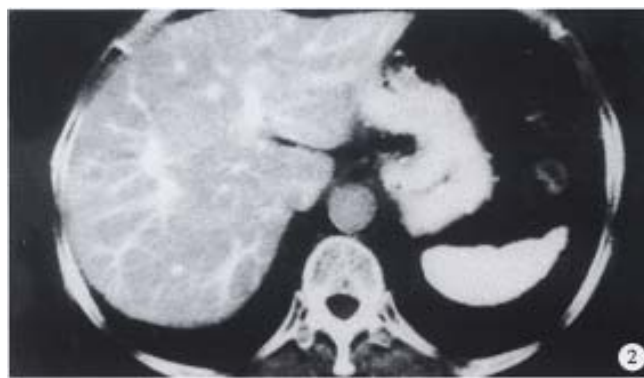


Figure 2 CTHA image obtained on the same slice to Figure 1, the micro-tumor manifested as an small round enhancement nodule.

Figure 3 CTHA in a 45-year-old man shows a micro-cancer with a diameter of 0.3 cm.

Figure 4 A punctuate lipiodol deposit focus with 0.2 cm in diameter is shown on Lp-CT in a 28-year-old woman with elevated serum AFP level of 860 $\mu\text{g/L}$ detects which was not detected by CTAP and CTHA.

Figure 5 CTHA in a 35-year-old man shows two punctuate non-pathologic enhancement foci on the edge of right lobe.

DISCUSSION

In some of our patients found with elevated serum level by AFP, no tumors were detected by conventional CT scanning. For those patients, CTAP and CTHA examinations were recommended. Fleckly perfusion defects were found on CTAP (Figure 1) and punctate enhancement foci on CTHA (Figure 2). After CTHA examination, 3 mL-5 mL mixture of lipiodol and anticancer drug was tentatively injected in to hepatic artery for Lp-CT diagnosis, which was repeated three or four weeks later. Micro-foci of lipiodol deposit was found with elevated serum AFP level, which dropped continuous to normal. The prognosis of these patients was very good. Since April 1996, 12 patients with such findings have been examined in our hospital. All patients were surviving without any signs of recurrence, and the longest survival being 33 months. Due to its special clinical significance, we suggested the definition of micro-cancer in liver (0.2cm-06cm in diameter) which includes: ① elevated serum AFP level (AFP \geq 400 μ g/L, or rising continuously); ② no micro-tumors were detected by conventional imaging methods, but by CTAP and CTHA; ③ Punctate lipiodol deposit foci were demonstrated on Lp-CT; and ④ after Lp-CT, serum AFP level lowered continuous or turned to normal level. CTAP and CTHA are considered as the most sensitive imaging methods for detecting small hepatocellular carcinoma^[3]. The development of spiral CT technique greatly facilitated procedures and improved the quality of CT images^[4]. Detectability of CTAP and CTHA for very small tumors (as small as 0.2 cm in diameter, Figure 3) was high, being 68.2% and 77.3% respectively, and that of simultaneous use of both procedures was 84.4%. But there were still some cases of micro-tumors which could not be detected by CTAP and CTHA. In a 28-year-old female patient with elevated AFP level of 860 μ g/L, no tumors were found either on conventional CT scanning or on CTAP and CTHA images. Three weeks later, Lp-CT detected a punctate lipiodol deposit focus of 0.2 cm in diameter in her left lobe with AFP continuous dropping to normal level (Figure 4). This patient had survived for 33 months without any signs of recurrence. With the widespread use of CTAP and CTHA, there have been more reports on non-pathologic perfusion defects detected with CTAP and non-pathologic enhancement detected with CTHA. Due to aberration of blood supply for some parts of the liver, such as arterio-portal shunt^[5], cirrhotic nodule, focal nodular hyperplasia, and focal fatty infiltration, the normal tissue could manifest as perfusion defects in CTAP, especially in the

medial segment of the left lobe^[6]. Peterson *et al* reported that perfusion defects on CTAP were sometimes nonspecific, and peripheral flat or wedge-shaped perfusion defects indicated benignity^[7]. In our study, the occurrence rate of non-pathologic perfusion defects detected with CTAP was 15.1%, and peripheral wedge-shaped perfusion defects were most common^[8]. Similar to findings of CTAP, pseudo-lesion enhancement of normal liver tissue also occurred in CTHA. Kanematsu *et al* supposed that local non-pathologic enhancement detected with CTHA might result from the cystic venous drainage or peripheral arterio-portal shunts^[9]. In our study, the occurrence rate of non-pathologic enhancement detected with CTHA was 22.0%, and small round peripheral enhancement was seen most commonly^[8] (Figure 5). Thus, we do not recommend to use CTAP or CTHA alone to interpret small hepatocellular carcinomas. The combined use of both procedures can help distinguish micro-cancer from the false-positive findings on CTAP and CTHA, and increase the accuracy of diagnosis for small hepatocellular carcinoma^[10]. Besides the findings on CTAP and CTHA images, combination of lipiodol deposit foci on Lp-CT and dropping of elevated serum AFP level are also helpful for the establishment of diagnosis for liver micro-cancer.

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