other malignancies before liver transplantation or surgical resection, and (2) monitoring of extrahepatic metastases after chemotherapy or radiation therapy.

In our study, not all of the extrahepatic metastases were proven by histological examination. However, in patients with known HCC and with no other primary tumor, the development of a new lesion or the interval increase of previously noted extrahepatic lesions strongly suggests metastases of HCC. Second, the sample size was small, and further studies need to be carried out on a larger number of patients.

In conclusion, the sensitivity of PET plus CT fusion images for the detection of extrahepatic metastases was high in HCC and combined HCC/CC patients. Skeletal and lymph node metastases may be detected more effectively by PET or PET plus CT fusion images than by the conventional diagnostic workup, bone scintigraphy or CT alone. Whole-body PET and PET/CT will be effective diagnostic tools for noninvasive staging of HCC before liver transplantation, surgical resection, and monitoring after radiation therapy and chemotherapy.

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## Figure Legends

**Figure 1. A 76-year-old male patient with HCC (Patient 17).**

A, Enhanced abdominal CT shows thickening of the peritoneal wall (white arrowhead).

B, Corresponding $^{18}$F-FDG PET shows an area of increased tracer uptake in lesions of the peritoneum (white arrow).

C, Fused PET/CT localizes the area of increased tracer uptake in the peritoneum (white arrow). The peritoneal metastasis of HCC was proven by surgical resection.

D, Histological findings showing moderately differentiated hepatocellular carcinoma in the liver.

E, Histological findings showing invasion of hepatocellular carcinoma in the peritonium.

**Figure 2. A 58-year-old female patient with HCC (Patient 12).**

A, Enhanced chest CT shows a lymph node swelling (white arrowhead).

B, Corresponding $^{18}$F-FDG PET shows an area of increased tracer uptake in lower mediastinum (white arrow).

C, Fused PET/CT localizes the area of increased tracer uptake in the lymph node (white arrow).

D, Histological findings of the autopsy showing high-power view of combined hepatocellular-cholangiocarcinoma (combined HCC/CC) in the liver. The tumor demonstrates cytological features that are intermediate between hepatocellular carcinoma (HCC) and cholangiocarcinoma.

400 E, Macroscopic image of metastasis in the supradiaphragmatic lymph node.

F, High-power view of lymph node metastasis of combined HCC/CC.

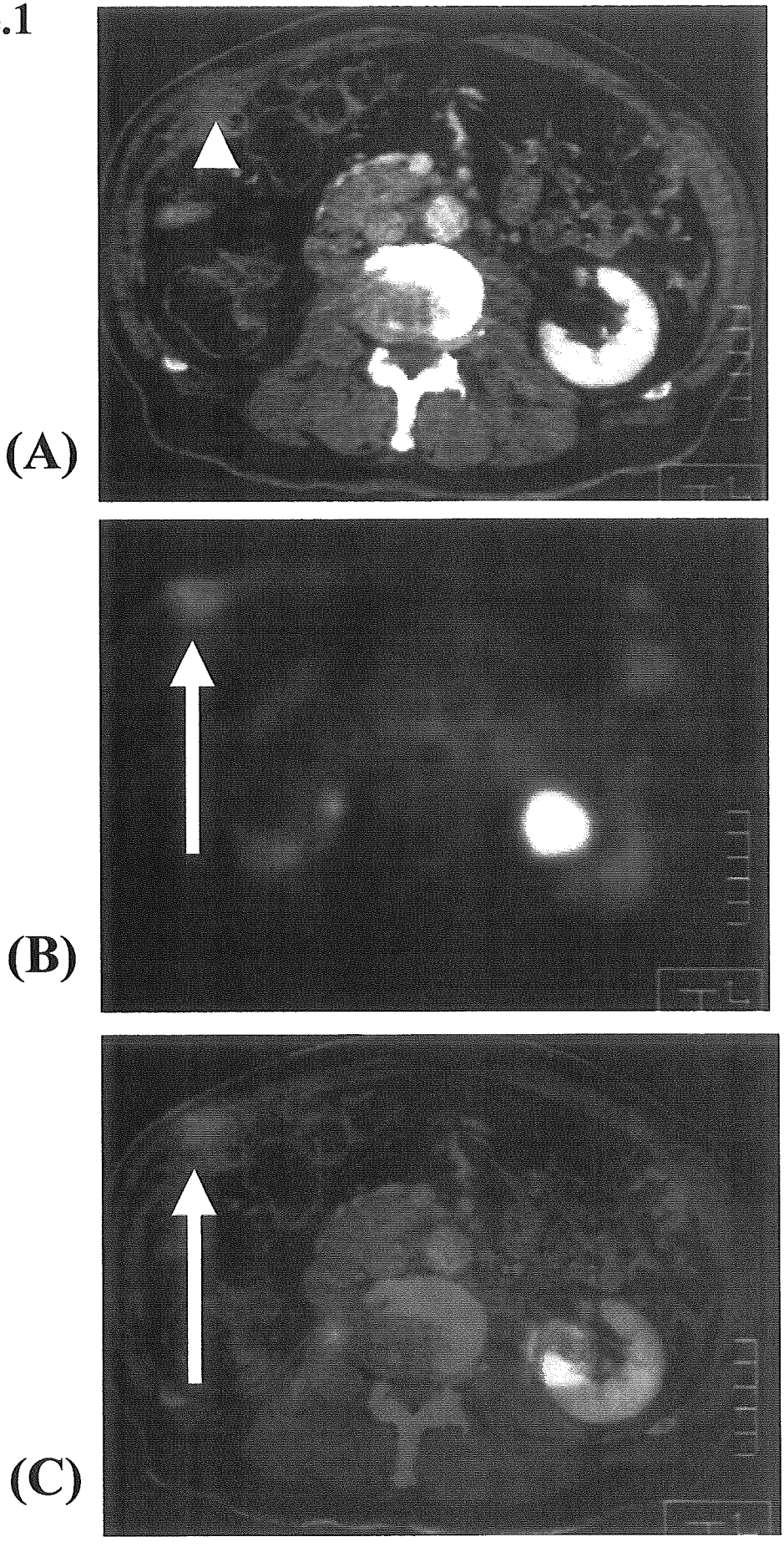
## TABLE 1

| Case no | Age | Sex | AFP (ng/mL) | L-3 (%) | DCP (mAU/mL) | Extrahepatic metastases | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Location | Number of lesion | Maximum size | PET | PET/CT |
| 1 | 72 | M | 1155 | 36 | 4070 | ND | - | - | TN | TN |
| 2 | 72 | M | 1343 | 40 | 209 | ND | - | - | TN | TN |
| 3 | 48 | M | 21.5 | ND | 11 | ND | - | - | TN | TN |
| 4 | 51 | F | 94512 | 59 | 10575 | ND | - | - | TN | TN |
| 5 | 51 | M | 1498 | ND | 104 | ND | - | - | TN | TN |
| 6 | 64 | M | 318 | 69 | 17135 | ND | - | - | TN | TN |
| 7 | 74 | F | 278 | ND | 21 | ND | - | - | TN | TN |
| 8 | 53 | M | 3.5 | ND | 27 | LN(5) | 5 | 3.6 | Positive | Positive |
| 9 | 34 | M | 382 | 48 | 106 | Lung(6),LN(1), kidney(1), Diaphragm(1) | 9 | 5.1 | 6/9Positive | Positive |
| 10 | 59 | F | 1171 | 4.1 | 52074 | Bone(5) | 5 | 3.1 | Positive | Positive |
| 11 | 58 | M | 8706 | 27 | 4803 | Lung | 1 | 1 | Positive | Positive |
| 12 | 58 | F | 188.5 | 40 | 2264 | LN(4) | 4 | 3.3 | Positive | Positive |
| 13 | 71 | M | 1909 | 35 | 2088 | Diaphragm | 1 | 5.1 | Positive | Positive |
| 14 | 73 | M | 6.9 | ND | 464 | Bone(2) | 2 | 3.5 | Positive | Positive |
| 15 | 80 | M | 3756 | 82 | 43 | Lung(1), LN(4), Bone(6), Spleen(1), Peritonium(1) | 13 | 7.3 | Positive | Positive |
| 16 | 56 | M | 59.5 | ND | 4053 | Bone | 1 | 5.3 | Negative | Positive |
| 17 | 76 | M | 158.7 | 8.4 | 900 | Peritonium(3), Diaphragm(1) | 4 | 9 | 3/4Positive | 3/4Positive |
| 18 | 67 | F | 30.4 | 29 | 33 | Subcutaness | 1 | 2 | Positive | Positive |
| 19 | 66 | M | 7.8 | ND | 427 | Lung | 1 | 2 | Positive | Positive |
| 20 | 64 | M | 15.4 | ND | 336 | Lung(1), LN(2) | 3 | 3.7 | Positive | Positive |
| 21 | 54 | M | 84.4 | 11 | 109 | LN(6), bone(2) | 8 | 3.2 | Positive | Positive |

M: male, F: female, ND: not detect, TN: true negative, TP: true positive, FN: false negative, AFP: alpha-fetoprotein,

Lens culinaris agglutinin-reactive fraction of alpha-fetoprotein (AFP-L3), DCP: des-gamma-carboxy prothrombin, LN: lymph node, PET/CT: PET plus CT fusion images

**Figure.1**



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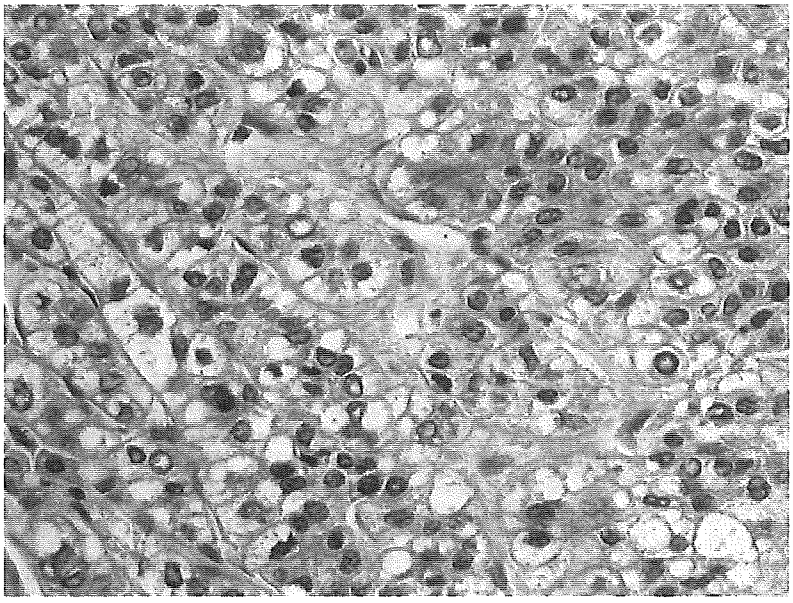

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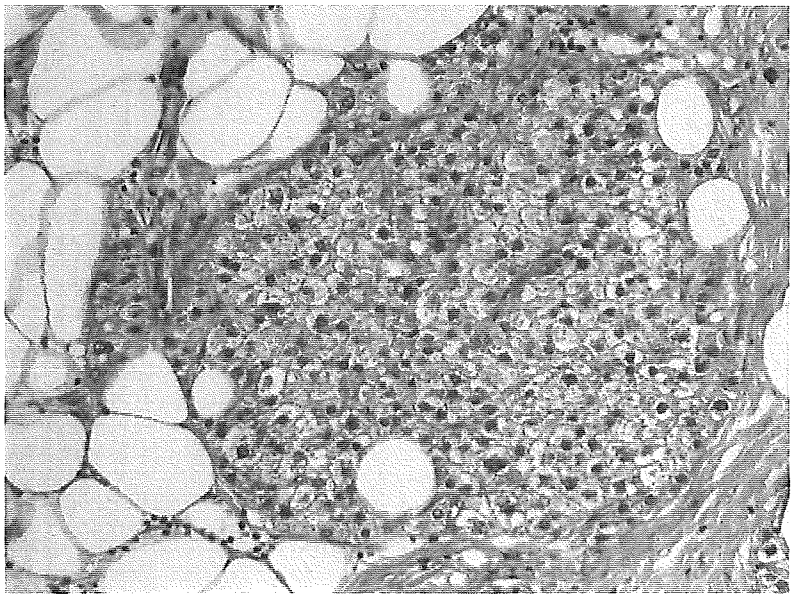
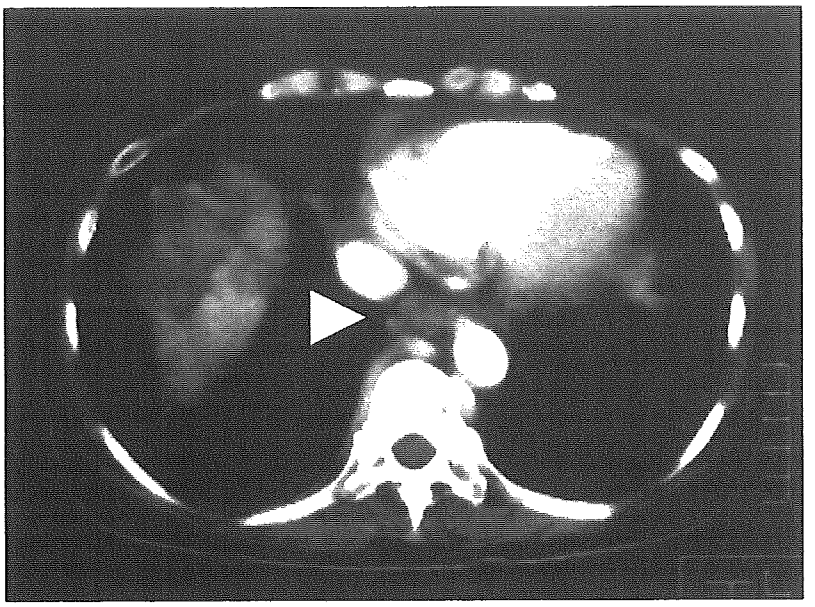


**Figure.2**

(A)



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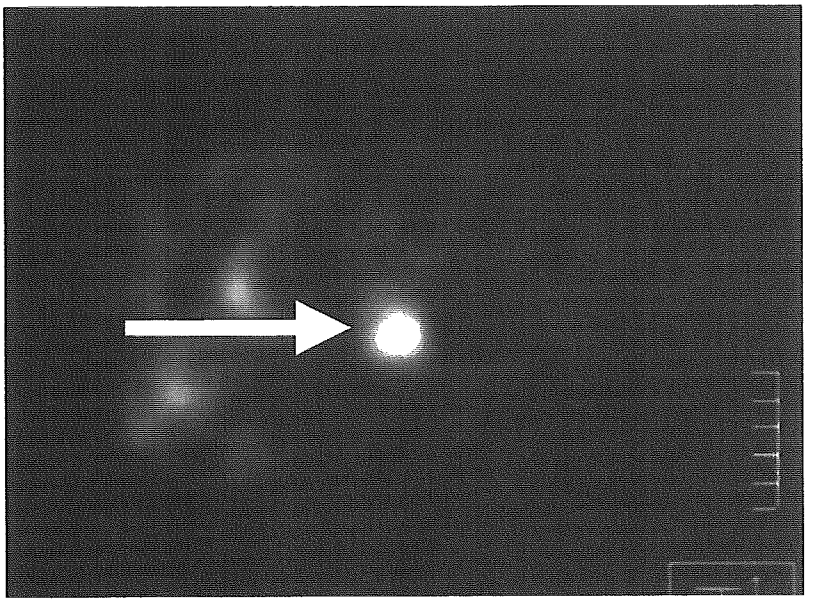

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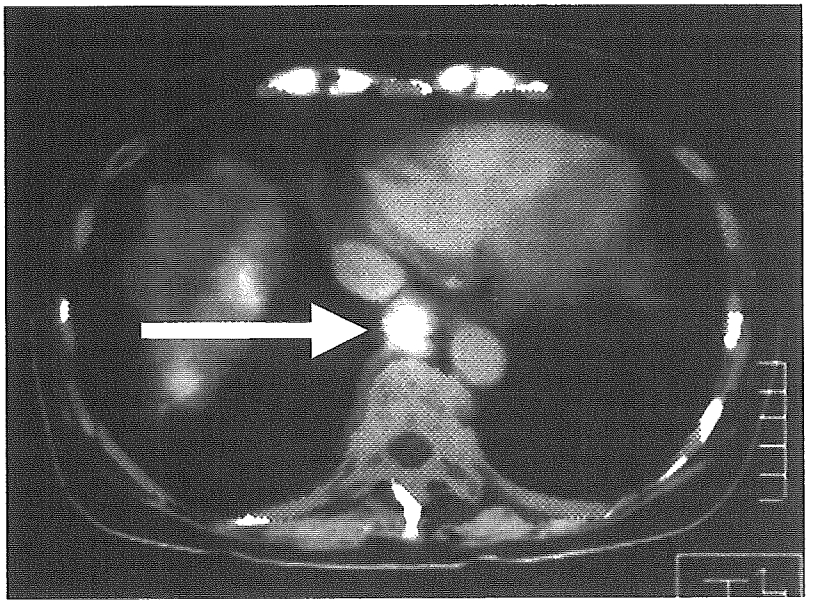

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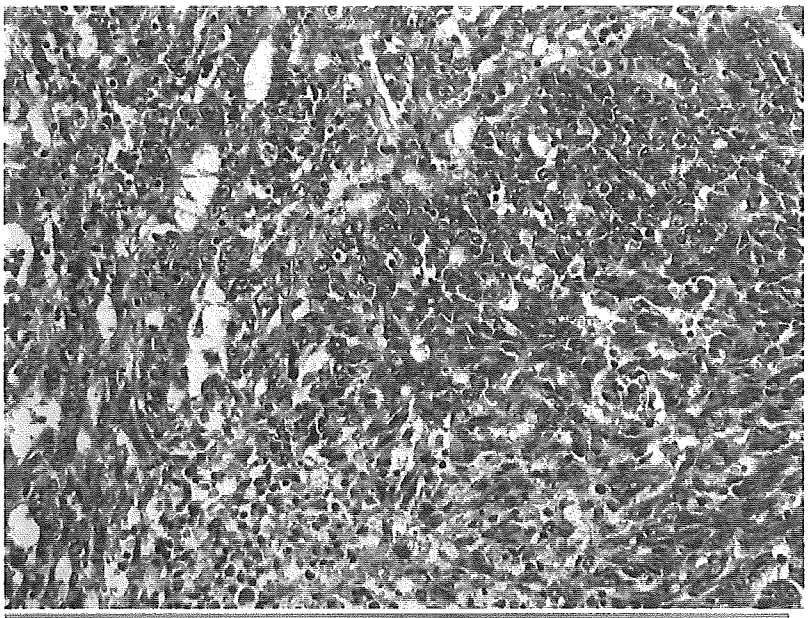

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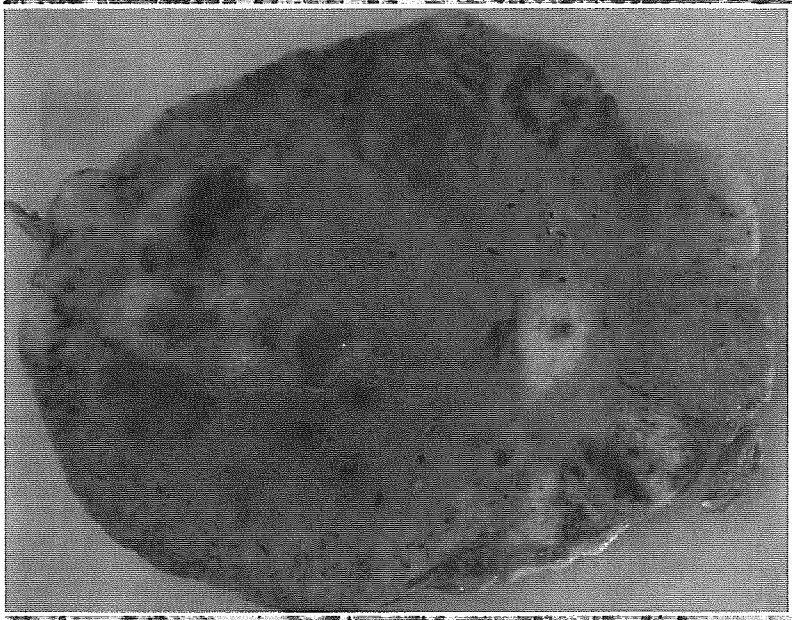

(F)