LETTER TO THE EDITORS

Detection of a new hepatic lesion suspicious for malignancy in a living donor using intraoperative ultrasonography

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Dear Editors,

For living-donor liver transplantation (LT), preoperative imaging modalities including computed tomography and/or magnetic resonance imaging are performed to determine the anatomy of the hepatic vessels and to ensure the absence of malignant hepatic lesions. However, intraoperative staging modalities such as visual inspection, palpation, and intraoperative ultrasonography (IOUS) can reveal new lesions that are not visualized preoperatively [1,2]. Hepatic malignancy in living donors would have an adverse influence on the survival of both the donors and recipients if liver grafts were recovered and transplanted. In this study, we report a case of our first experience involving a living-donor LT, during which a new lesion suspicious of malignancy was identified intraoperatively using ultrasonography.

A 50-year-old woman became a living-donor candidate regarding LT for her husband who had alcohol-related liver disease. The absence of potential malignant lesions in the liver was confirmed using computed tomography (CT) (320 detector rows, Aquilion ONE ViSION Edition; Toshiba Medical, Tokyo, Japan) with a contrast agent and magnetic resonance imaging (MRI) (1.5-T system, Signa HDX 1.5 T; GE Medical Systems, Milwaukee, WI, USA). The donor CT protocol included three phases: the arterial phase (25 s after the injection of contrast material), the portal phase (37 s), and the equivalent phase (90 s). The donor MRI protocol is included T1-weighted image, T2-weighted image, diffusion-weighted image, and magnetic resonance cholangiopancreatography. Right liver procurement was planned after volumetric analysis of the liver. Regarding blood tests, carcinoembryonic antigen was found to be elevated (9.7 ng/ml; institutional upper limit, 5.0 ng/ml) most likely because of the donor's smoking history; smoking ceased 1 month before the blood test (Brinkman index, 4500).

Under general and epidural anesthesia, a J-shaped incision was made and right liver mobilization was undertaken. No tumor was found at the liver using both visual inspection and palpation. IOUS was performed to identify the anatomy of the hepatic vessels. During surveillance using IOUS, a hypoechoic to isoechoic tumor was visualized above the root of the left and middle hepatic vein in segments II and IV (Fig. 1a). No tumor was identified in CT (Fig. 1a) although the corresponding hepatic regions were intraoperatively investigated by surgeons and radiologists. The procedure was held until family members were informed about the need to remove the hepatic lesion; they agreed with our proposal, to undertake excision biopsy of the tumor. The assessed remnant donor liver volume was 369 ml, corresponding to 37.3% of the donor total liver volume. Partial liver resection to remove the tumor was performed (Fig. 2a and b) because the remnant liver volume can be preserved more than 30% of the donor total liver volume, which is our criteria for minimum requirement of the donor liver remnant. The specimen weight was 10 g (1.0% of the donor total liver volume), and it was sent for intraoperative histopathological investigation. Macroscopically, the tumor appeared whitish (Fig. 2c), 7 mm in diameter, and microscopically, it comprised proliferative lymphatic cells (Fig. 2d). It was intraoperatively diagnosed as a benign lesion that lacked any evidence of lymphoma. After explaining the results to the family members of the donor and

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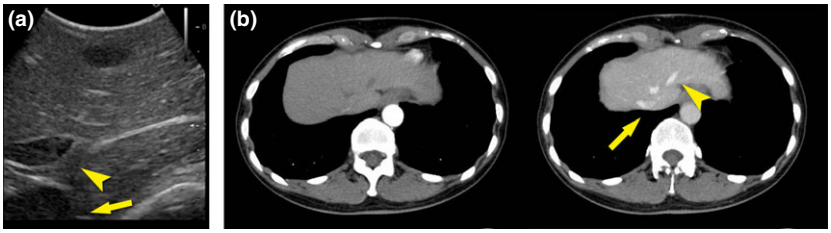

Figure 1 (a) A tumor was visualized as a hypoechoic lesion in IOUS (arrow, the inferior vena cava; arrowhead, the left hepatic vein). (b) No tumor was identified either in the arterial phase (left) or in the equilibrium phase (right; arrow, the inferior vena cava; arrowhead, the left hepatic vein).

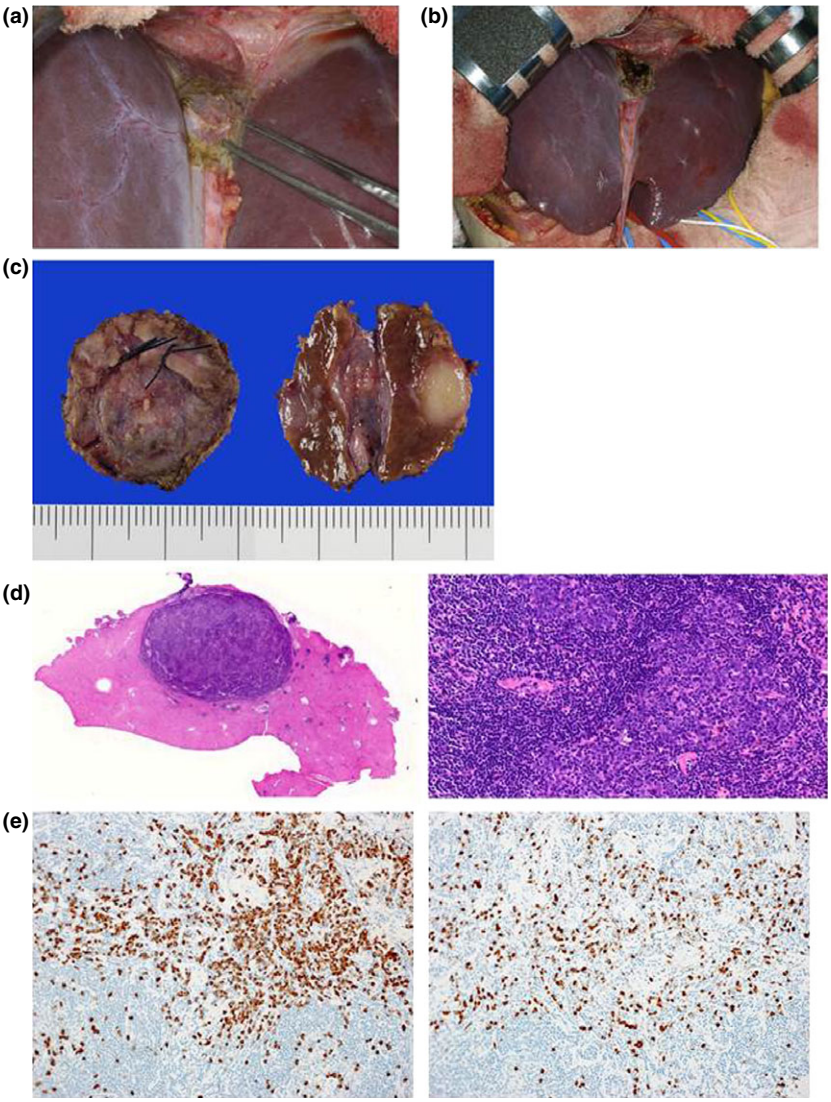

Figure 2 (a) The tumor was located in segments II or IV. (b) Gross appearance of the liver after wedge resection of the tumor for histopathological diagnosis. (c) The specimen included a whitish tumor of 7 mm in diameter. (d) The tumor was composed of proliferative lymphatic cells without atypia. (e) Negative finding of light-chain restriction in the κ, λ-*in situ* hybridization (left, κ-*in situ* hybridization; right, λ-*in situ* hybridization).

recipient, procurement of the right liver was resumed. Two drainage tubes were inserted at the cut surfaces of right liver procurement and partial liver resection. She developed a bile leak through the drainage tube at the cut surface of right liver procurement although the leak point was unclear (the stump of the right hepatic duct

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or the cut surface of the right liver procurement). The drainage tube at the cut surface of partial liver resection was removed on postoperative day one because of no obvious bile leak. She was discharged on postoperative day 18, because of the conservative treatment for the bile leak. The final histopathological diagnosis was lymphoid hyperplasia; the tumor comprised nonclonal T and B cells and light-chain restriction according to κ, λ-*in situ* hybridization (Fig. 2e). Additionally, there was a lack of variable damage to the biliary epithelium, which is typical of primary hepatic mucosa-associated lymphoid tissue lymphoma.

In a living-donor LT setting, the donors' safety and survival is the first priority. In the present case, a routine surveillance of the liver using IOUS identified a tumor that had not been visualized using pretransplant imaging modalities. Fortunately, the tumor was intraoperatively diagnosed as having a low malignant potential. However, right liver procurement would have impaired the donor's and the recipient's survivals if a malignancy had been missed.

Over reliance concerning recent advances in imaging technologies should be avoided because not all hepatic lesions can be visualized preoperatively [1–3]. The lesion was missed probably on the imaging studies due to its small size (< 1cm) and its location close to the heart with the effect of the heart beats. CT and MRI were taken 2 months before living-donor liver transplantation, and the lesion might have appeared during in-between 2 months. Intraoperative ultrasonography reportedly visualized incidental new lesions in 25.6% patients (50/195) with hepatocellular carcinoma [1]. Donors may not have the opportunity to undergo curative and radical hepatic surgery in the future because of insufficient remaining liver volume, if they donate healthy hemilivers and have a malignancy in the liver remnant. Additionally, recipients would suffer from the transmission of malignancy if they received liver grafts that included malignant lesions. The transmission of donor-derived malignancy has reportedly occurred, but the risk was found to be low in a deceased-donor LT setting after curative treatment and a subsequent disease free interval [4,5].

In conclusion, IOUS identified a tumor in the donor liver, which was not visualized by pretransplant imaging modalities. The present findings confirm the importance of intraoperative vigilant surveillance of donor livers in living-donor LT to minimize health and prognostic risks for both donors and recipients.

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Conflicts of interest

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