SCANNING ELECTRON MICROSCOPY OF A LIVER CAVERNOUS HEMANGIOMA

Kazuhide YAMAMOTO, M.D., Tatsuya ITOSHIMA, M.D., Toshio ITO, M.D., Minoru UKIDA, M.D., Hiromichi OGAWA, M.D., Masahiro KITADAI, M.D., Shuzo HATTORI, M.D., Shigeki MIZUTANI, M.D. and Hideo NAGASHIMA, M.D.

First Department of Internal Medicine, Okayama University Medical School, Okayama 700, Japan

Summary

A 39-year-old female with a large cavernous hemangioma of the liver was successfully treated by ligation of the left hepatic artery. A wedge biopsy specimen of the hemangioma was obtained after the ligation and was examined by scanning electron microscopy. The hemangioma was demarcated from the surrounding normal liver parenchyma and had a labyrinth of caves 50–150 µm in diameter. The caves were separated by fibrous septa 20–40 µm in width. Endothelial cells of the caves were spindle-shaped and arranged in parallel. The surface property of the caves resembled that of the hepatic artery and differed from that of the portal vein or hepatic vein. These findings support that the cavernous hemangioma of the liver was supplied by the hepatic artery. The labyrinthine structure of the cavernous hemangioma may explain the long standing contrast enhancement of the hemangioma after hepatic arteriography.

Key Words: scanning electron microscopy, liver cavernous hemangioma, hepatic artery ligation, arteriography of hemangioma.

Introduction

Cavernous hemangioma of the liver is a benign tumor1–4), but large ones sometimes require treatment because of clinical symptoms or serious complications5–8). In this paper, we report on a patient with a large cavernous hemangioma of the liver which was successfully treated by ligation of the supplying artery.

Scanning electron microscopy (SEM) is suited to demonstrate such intricated tissues as hemangioma three-dimensionally9–12). Experimental hemangiosarcoma of the liver9), hemangiosarcoma of the breast10) and cutaneous capillary hemangioma11) have been observed by SEM. However, cavernous hemangioma of the liver has not been fully observed. Therefore, in this study SEM was applied to investigate what kind of blood vessels composed the cavernous structure of the hemangioma.

Case Report

A 39-year-old Japanese female with the chief complaint of an upper abdominal tumor was admitted to our hospital on April 21, 1976. She had been in good health until December 1975, when she first experienced abdominal full sensation and general malaise. These symp-
toms continued until operation. Physical examination revealed an elastic smooth mass, about 10 cm in diameter in the epigastrium. Pulsation or a vascular murmur was not noted on the tumor. The liver with normal consistency was palpated 2 cm below the right costal margin on the right mid-clavicular line.

Laboratory studies revealed the following: red blood cells, $402 \times 10^4/mm^3$; platelets, $24 \times 10^4/mm^3$; serum bilirubin, 0.45 mg/dl; serum glutamic oxaloacetic transaminase activity, 20 Karmen units; serum fibrinogen, 198 mg/dl; and serum fibrin degradation products, 5 μg/ml (normal, below 10 μg/ml).

$^{198}$Au-colloid liver scintigram showed a large defect in the left half of the liver (Fig. 1). Computed tomography revealed a large liver tumor (15 × 10 cm) occupying the left lobe and the antero-median region of the right lobe (Fig. 2). A radiolucent area (7 × 3 cm) was observed in the tumor. Celiac angiography showed scattered poolings of contrast medium in the region supplied by the left hepatic artery (Fig. 4) and revealed an avascular area corresponding to the radiolucent area in the computed tomography. Peritoneoscopy demonstrated a large, red-purple and elastic tumor which occupied the liver in the left side of the Cantlie line (Fig. 3). The tumor was diagnosed as a liver cavernous hemangioma, and the avascular area was suspected to be a hematoma. Needle biopsy of the hemangioma was not performed.

$^{60}$Co irradiation of 3,500 rads in 35 days did not show remarkable effects on the hemangioma. As the hemangioma was too large to be easily resected, ligation of the left hepatic artery was performed. The hemangioma showed marked shrinkage, and angiography after the ligation revealed a decrease of the tumor size (Fig. 5). The liver tumor has not been detected by palpation 6 years after operation.

Materials and Methods

A wedge biopsy of the liver hemangioma was obtained after ligation of the left hepatic artery. A part of the biopsy specimen was prepared for light microscopy. The other part was puncture-perfused by a syringe with Ringer solution containing heparin and then with 2% glutaraldehyde in 0.1 M phosphate buffer (pH 7.4). The specimen was cut into small blocks. The blocks were treated with the revised tannin-osmium method, dehydrated in a graded series of ethanol, dried in carbon dioxide with a critical point dryer, and observed by SEM (JEOL; JSM U-3) with an accelerating voltage of 15 kV.

Results

Light microscopy confirmed the liver tumor to be a cavernous hemangioma (Fig. 6a). The hemangioma was demarcated from the surrounding normal liver parenchyma and consisted of numerous compartments lined by flat endothelia. The compartments were separated by fibrous septa of 20–40 μm thickness which contained collagen and elastic fibers. One or two layers of elastic fiber bundles were arranged in parallel to the endothelial lining. In the compartments, red blood cells were observed. In the surrounding liver parenchyma, blood vessels different from branches of the hepatic artery, the portal vein or the central vein were observed (Fig. 6b). The blood vessels were directly surrounded by liver cells and line by flat endothelia.

SEM demonstrated the hemangioma three-dimensionally (Figs. 7–11). The hemangioma was composed of numerous caves 50–150 μm in width, which were irregular in shape and size (Fig. 7a). The caves formed a labyrinth, communicating with each other through a window 20–100 μm. They were mostly separated by a fibrous septum 20–40 μm in width and were