Simultaneous Operations for Abdominal Aortic Aneurysm and Liver Cancer Complicated by Severe Ischemic Heart Disease: Report of a Case

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Abstract
We performed successful simultaneous operations for an abdominal aortic aneurysm (AAA) and liver cancer in a patient complicated by severe ischemic heart disease. A 59-year-old man with a history of liver dysfunction presented with acute epigastric pain. Abdominal computed tomography findings of ascites and a liver tumor indicated a diagnosis of ruptured hepatocellular carcinoma. He had a concomitant 65-mm AAA and a 48-mm right common iliac aneurysm. Elective surgery was scheduled because of his good general condition. Although triple-vessel disease was detected preoperatively, there were no grafted coronary arteries. The aneurysms were repaired first to utilize intra-aortic balloon pumping (IABP) during resection of the liver cancer, followed by left lateral segmentectomy. Perioperative hemodynamics were maintained by administering catecholamines and vasodilators, without the need for IABP. The patient was discharged on the 21st postoperative day without any complications, and no recurrence of liver cancer has been found in the 5 months since his operation.

Key words Simultaneous operation · Abdominal aortic aneurysm · Liver cancer · Ischemic heart disease

Introduction
Abdominal aortic aneurysm (AAA) is often diagnosed during assessment for gastrointestinal diseases.1 In fact, according to various reports, 4.5%,2 8.6%,3 11.2%,4 and 18.2%5 of patients with AAA have malignancy of the digestive organs. However, it remains controversial whether resection of the AAA and the malignancy should be performed simultaneously or in two stages, and which lesion should be operated on first if staged surgery is chosen. It is important to consider the functions of the vital organs when deciding on whether simultaneous or two-staged surgery should be performed. This report describes how simultaneous surgery was performed for a patient with AAA and liver cancer complicated by severe ischemic heart disease (IHD). We also discuss some of the problems associated with performing simultaneous resections in this type of patient.

Case Report
A 59-year-old man with a 1-year history of liver dysfunction, for which he had been receiving medical treatment, presented to another hospital with acute epigastric pain. He was referred to our department after an abdominal computed tomography (CT) scan showed ascites, a liver tumor, and AAA. He had a concomitant 65-mm AAA and a 48-mm right common iliac aneurysm. Elective surgery was scheduled because of his good general condition. Although triple-vessel disease was detected preoperatively, there were no grafted coronary arteries. The aneurysms were repaired first to utilize intra-aortic balloon pumping (IABP) during resection of the liver cancer, followed by left lateral segmentectomy. Perioperative hemodynamics were maintained by administering catecholamines and vasodilators, without the need for IABP. The patient was discharged on the 21st postoperative day without any complications, and no recurrence of liver cancer has been found in the 5 months since his operation.

The red blood cell count was 403 x 10^6/µl, hemoglobin 12.8 g/dl, hematocrit 37.8%, platelet count 20.0 x 10^6/µl, total protein 6.1 g/µl, albumin 3.3 g/dl, glutamine-oxaloacetic transaminase (GOT) 28 IU/l, glutamic-pyruvic transaminase (GPT) 13 IU/l, lactate dehydrogenase (LDH) 313 IU/l, and prothrombin concentration (PC) 72%, which were all within the normal range. However, the following values were increased: total bilirubin (T-Bil), 1.8 g/dl; direct bilirubin, 0.4 g/dl; white blood cell count, 13,600/µl; C-reactive protein, 22.2 mg/dl; a-fetoprotein, 1,561 ng/ml (72% of L3 ratio); and protein induced by vitamin K antagonist-II...
(PIVKA-II) 9980 mAU/ml. The indocyanine green dye retention rate 15 min after injection of 0.5 mg/kg (ICGR15) was 17%. Hepatitis B virus surface antigen, core antibody, envelope antigen and antibody, and hepatitis C virus antibody were all negative.

Abdominal CT scan showed an infrarenal AAA, 65 mm in maximum diameter, with mural thrombi (Fig. 1A) and a right common iliac aneurysm (RCIA), 48 mm in maximum diameter (Fig. 1B). It also revealed ascites as well as a low-density area, 14 cm in diameter, in the lateral segment of the liver (Fig. 1C), which was recognized as a lobular tumor with high intensity by dynamic magnetic resonance imaging (MRI) scan (Fig. 1D).

The liver tumor was diagnosed as hepatocellular carcinoma (HCC) at stage IV-A (T4 N0 M0) according to the Classification of Primary Liver Carcinoma (CPLC), because there was no evidence of metastasis or lymph node swelling in the abdomen. The ascites found on the abdominal CT scan and the sudden onset of epigastric pain were judged to be the result of rupture of the liver cancer.

He had an abnormal Q wave of V5 on electrocardiography (ECG). Echocardiography showed dilatation of the left atrium and left ventricle (LV), diffuse hypokinesis of LV wall motion, and 38% ejection fraction (EF), indicating an old myocardial infarction. Transesophageal atrial pacing up to 130 beats/min did not cause any ischemic changes on the ECG. A coronary angiography (CAG) revealed triple-vessel disease; with 75% stenosis of #3, 90% of #4, 99% of #7, 99% of #8, 99% of #9, 90% of #10, 90% of #12, 99% of #13, and 99% of #14 (Fig. 2). Cardiac catheterization indicated severe cardiac dysfunction, with a pulmonary artery pressure of 64/28 (43) mmHg, a mean pulmonary capillary wedge pressure (PCWP) of 30 mmHg, an LV end-diastolic pressure of 28 mmHg, and a cardiac index (CI) of 2.29 l/min per m². The patient was treated medically with an angiotensin-converting enzyme inhibitor, diuretics, and nitroglycerin up until surgery.

He was not anemic and his general condition was good, so elective surgery was scheduled. To prevent rerupture of the liver cancer and rupture of the 65-mm AAA and the 48-mm RCIA, a simultaneous operation