Effectiveness of Chemoembolization Therapy for Metastatic Right Atrial Tumor Thrombus Associated with Hepatocellular Carcinoma*

Yasunobu Dazai M.D.; Toshikazu Katoh M.D.; Ichijiro Katoh M.D.; Shousu Sueda M.D.; and Ryoichi Yoshida M.D.

A rare case of hepatocellular carcinoma (HCC) was complicated by metastatic right atrial tumor thrombus (RATT), which diminished in size on echocardiograms and showed necrotic change on computed tomography (CT) scans after chemoembolization therapy. (Chest 1989; 96:434-36)

HCC = hepatocellular carcinoma; RATT = right atrial tumor thrombus

Only four cases of metastatic RATT complicating HCC and detected echocardiographically were found in a review of the English literature.1,2 We report the echocardiographic and CT changes of RATT after chemoembolization therapy using an oily suspension of iodized oil (Lipiodol) and anticancer drugs.

Case Report

A 42-year-old man presented with a family history of liver disease and HCC. He had a two-month history of right hypochondralgia and abdominal fullness. Clinical examination revealed mild jaundice and ascites. Anemia, spider nevi and palmar erythema were not seen. Auscultation of the heart revealed no abnormalities, and the blood pressure was 142/86 mm Hg. The heart rate was 78 beats per minute. Diminished vesicular breathing sounds were heard in the right lower lung field. The superficial veins of the thoracoabdominal region were markedly dilated. The liver was nodular, hard and enlarged to 5 cm below the right costal margin. The spleen was enlarged to 5 cm below the left costal margin. Leg edema was present.

A chest x-ray film showed a small right pleural effusion, and ventricular premature contractions were found on the ECG. Alpha-feto protein was extremely high (743,800 ng/ml), serum glutamate oxaloacetatic transaminase (496 U), serum glutamate pyruvate transaminase (66K U), lactate dehydrogenase (542W U), total bilirubin (2.4 mg/dl), and alkaline phosphatase (160K A) were elevated. The viral marker tests showed the patient to be an HB virus carrier with negative HBs antigen.

Abdominal echogram favored HCC of the right hepatic lobe with portal vein tumor thrombus. The upper gastrointestinal x-ray series and barium enema were normal. The CT scan (Fig 1A) on admission revealed a broad low density area with necrosis of the right hepatic lobe, tumor within the inferior vena cava (IVC) and the right atrium (RA), and dilatation of the azygos vein. Two dimensional echocardiography (Fig 2) on admission revealed an immobile right atrial tumor connected to tumor within the IVC, with a fine granular echo pattern. The right atrial tumor showed a layered echo pattern on M-mode echocardiography. Selective celiac angiography (Fig 3) showed tumor vessels of the right hepatic lobe typical of HCC. The threads and streaks sign, which indicates feeder vessels of the tumor thrombus derived from the main tumor, was observed from the

*From the Department of Internal Medicine, Yawatahama City General Hospital, Oohira, Yawatahama, Ehime, Japan. Reprint requests: Dr. Dazai, Yawatahama City General Hospital, Oohira, Yawatahama, Ehime, Japan 796

References
5. Lapin ES, Murray JA. Hemoptysis with flow-directed cardiac catheterization. JAMA 1972; 220:1246
9. Shin MS, Ho KJ. Cavitary pulmonary lesions complicating use of flow-directed balloon-tipped catheters in two cases. AJR 1979; 132:650-52
hepatic vein to the IVC and RA. The right ramus of the portal vein was completely obstructed on portography. Immobile tumor of the IVC, a filling defect of the RA, and markedly developed upward collateral veins were found on inferior cavaography. The patient was then diagnosed as having HCC complicated by the secondary Budd-Chiari syndrome, due to true tumor thrombus of the venous system, and was treated with chemoembolization therapy using an oily suspension of Lipiodol (10 ml), doxorubicin (Adriamycin) (30 mg), and mitomycin C (10 mg).

After therapy, the ascites, pleural effusion, and dilated superficial veins resolved. Liver function was markedly improved and alphafeto protein decreased to 315,520 ng/ml. On CT scan taken 14 days after the therapy (Fig 1B), necrosis of the tumor thrombus within the IVC and RA was found. Two-dimensional echocardiography 55 days after the therapy (Fig 4) showed diminished RATT on multiple scannings, but the internal echo pattern of the tumor thrombus was scarcely altered. Seven months after therapy, the patient died with respiratory and hepatic failure. Anticoagulation therapy was not performed, and obvious pulmonary embolism was not observed either symptomatically or roentgenographically throughout his course.

**DISCUSSION**

In spite of the progress of therapy for HCC, when it is complicated by RATT, the prognosis has not improved. Lung metastasis is far higher in HCC complicated by RATT than in cases without it. The particular complications reported for RATT are pulmonary infarction due to separation of the tumor thrombus,3 the ball valve thrombus syndrome5 and the secondary Budd-Chiari syndrome.7

**FIGURE 1A (left)** Enhanced CT scan on admission. Tumor thrombus of the right atrium (arrowhead) and dilatation of theazygos vein were observed. **1B (right)** Enhanced CT scan taken 14 days after the chemoembolization therapy. Pooling of Lipiodol in, and necrosis of, the right atrial tumor thrombus (arrowhead) were found.

**FIGURE 2.** Two-dimensional echocardiography on admission. Right ventricular inflow tract view revealed immobile right atrial tumor thrombus (arrowhead) with fine granular echo pattern connected to tumor thrombus within the inferior vena cava. RA is right atrium; RV, right ventricle; LV, left ventricle.

**FIGURE 3.** Selective celiac angiography. Tumor vessels within the right hepatic lobe was seen. The thread and streaks signs (arrowheads) were revealed from the hepatic vein to the inferior vena cava and right atrium.
Therefore, the antemortem diagnosis of RATT is important.

Diagnostic methods for the RATT associated with the HCC include echocardiography, angiography, and radionuclide scintigraphy. However, no echocardiographic changes of the tumor thrombus before and after transarterial embozilation therapy have been reported previously. This is the first report of such changes. In our case, the tumor within the IVC and RA was not embolism, but the true tumor thrombus because of selective celiac angiographic and inferior cavalographic findings, and the diminishing of the true tumor thrombus after chemoemobilization therapy was clearly detected by echocardiography, but necrosis of the tumor thrombus shown by CT was barely evident on echocardiography. Though the mechanism of the diminution of RATT is thought to be necrosis and fragmentation, fragmentation is unlikely because a pulmonary embolic event was not detected clinically throughout his course.

Such thrombi associated with HCC are fed from tumor vessels derived from the hepatic artery. In our case, pooling of Lipiodol within the tumor thrombus was seen on CT scan after chemoemobilization therapy. This also shows hepatic arterial supply of the tumor thrombus. Therefore, chemoeomobilization therapy is considered to be an effective treatment against the secondary Budd-Chiari syndrome due to the tumor thrombus of the venous system.

**Clinical Limitation**

In our reported case, autopsy was not performed, and histologic diagnosis could not be established. However, the tumor was diagnosed as HCC by morphologic and physicochemical findings.

**References**

4 Tokuda K. Pathomorphologic study on hepatocellular carcinoma: a study of 10 cases with tumor thrombus in the right atrium of the heart. Kurume Med J 1978; 41:1044-51
8 Gregg FP, Goldstein HM, Wallace S, Casey JH. Arteriographic demonstration of intravenous tumor extension. Am J Roentgenol 1975; 123:100-05

**Neurogenic Pulmonary Edema after Trigeminal Nerve Blockade**

Robert S. Wright, M.D.;* Tony Feuerman, M.D.;† and Julie Brown, R.N.‡

Acute neurogenic pulmonary edema developed immediately after injection of bupivacaine hydrochloride into the trigeminal cistern of a 22-year-old man with atypical facial pain and no prior history of cardiopulmonary problems. This complication of trigeminal nerve blockade has not been reported previously, to our knowledge. Associated neurologic deficits suggest a key role for the brain stem in the pathogenesis of this disorder. (Chest 1989; 96:436-39)

Neurogenic pulmonary edema is a process that typically occurs after severe, and often devastating, CNS events. While the pathogenesis of the pulmonary edema is uncertain, two widely divergent hypotheses have been proposed. Some investigators think that marked hemodynamic alterations in the pulmonary circulation are of paramount importance, while others believe that neuroendocrine factors mediate a pulmonary capillary leak process.¹⁴ CNS events that have been associated with neurogenic pulmonary edema include severe head trauma, hemorrhagic strokes, generalized seizures, and various operative interventions.³ We report a case of short-lived neurogenic pulmonary edema occurring immediately after injection of the trigeminal

*Fellow, Department of Medicine, Division of Pulmonary and Critical Care Medicine, UCLA Hospital, Los Angeles.
†Resident, Department of Surgery, Division of Neurosurgery, UCLA Hospital, Los Angeles.
‡Staff nurse, Department of Anesthesiology, UCLA Hospital, Los Angeles.
Reprint requests: Dr. Wright, UCLA Hospital, Rm 20-186, 10833 LeConte Avenue, Los Angeles 90024