

Acute Pulmonary Embolism as the First Manifestation of Hepatocellular Carcinoma Complicated with Tumor Thrombi in the Inferior Vena Cava: Surgery or Not?

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Acute pulmonary embolism as the first manifestation of hepatocellular carcinoma (HCC) complicated with tumor thrombi in the inferior vena cava (IVC) and right atrium is rare [1]. These patients usually die within a short period because of pulmonary embolism, heart failure, or cancer progression [2]. Here, we describe a 57-year-old man who had HCC complicated with tumor thrombi and pulmonary embolism. He was initially unwilling to undergo surgery but agreed to the surgery after developing a tumor thrombus of the right atrium followed within 24 hr by acute respiratory failure. He died from complications arising from surgery. We reviewed published reports of 14 patients who had HCC and pulmonary embolism. The 1-year survival rate was higher for patients who underwent surgery (40%) than for patients who did not undergo surgery (0%). Therefore, hepatic resection and removal of tumor thrombi should be considered to prolong the patient's life span.

Case presentation

A 57-year-old man presented with severe substernal chest pain that had been present for the previous 2 weeks. With the exception of chronic hepatitis B, his medical and surgical histories and personal habits were noncontributory. He initially visited a local hospital, where abdominal ultrasonography revealed a hyperechoic lesion of the right lobe of the liver and an abdominal computed tomography scan revealed a hepatic mass at the inferior segment of the right lobe and IVC thrombi. The patient developed dyspnea and hemoptysis 1 day before he was referred to our hospital.

The results of the physical examination conducted upon admission were unremarkable except for tachycardia and pitting edema of the lower legs. Blood chemistry values worthy of note were as follows: hemoglobin, 12.4 g/dL (normal range, 13.5–18 g/dL); platelet count, $101 \times 10^9/L$ (normal range, $150\text{--}400 \times 10^9/L$); prothrombin time, 13.8 sec; prothrombin international normalized ratio, 1.4; aspartate aminotransferase, 48 U/L (normal range, 0–37 U/L); total bilirubin, 1.6 mg/dL (normal range, 0–1.0 mg/dL); albumin, 3.2 g/dL (normal range, 4–6 g/dL); D-dimer, 7833 ng/mL (normal range, <500 ng/mL); fibrinogen, 325 mg/dL (normal range, 200–400 mg/dL); and α -fetoprotein, 4.23 ng/mL (normal range, <20 ng/mL). Arterial blood gas values were as follows: pH 7.52; PaCO₂, 30.8 mm Hg; PaO₂, 105.7 mm Hg; HCO₃, 24.5 mmol/L; and FiO₂, 100%. A 12-lead ECG revealed the presence of sinus tachycardia. The chest radiograph was normal. A ventilation–perfusion lung scan detected multiple segmental perfusion defects with normal ventilation (Fig. 1A). Pulmonary embolism was confirmed and anticoagulant was administered.

Magnetic resonance imaging of the abdomen revealed a hepatoma about 4.5 cm in diameter over the inferior segment

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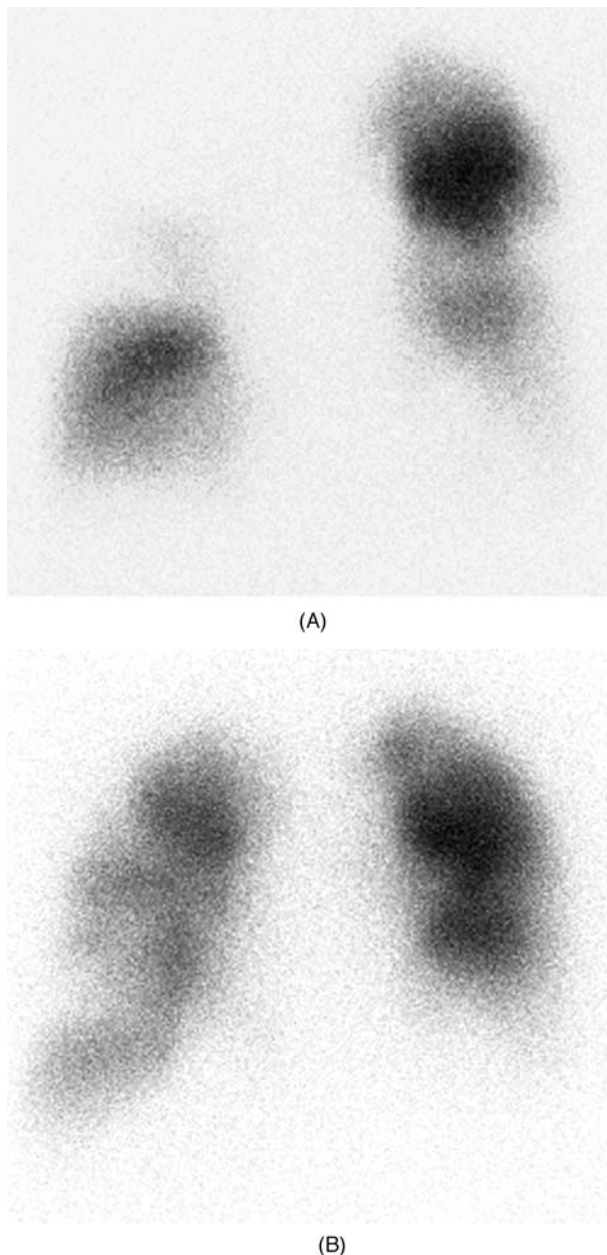
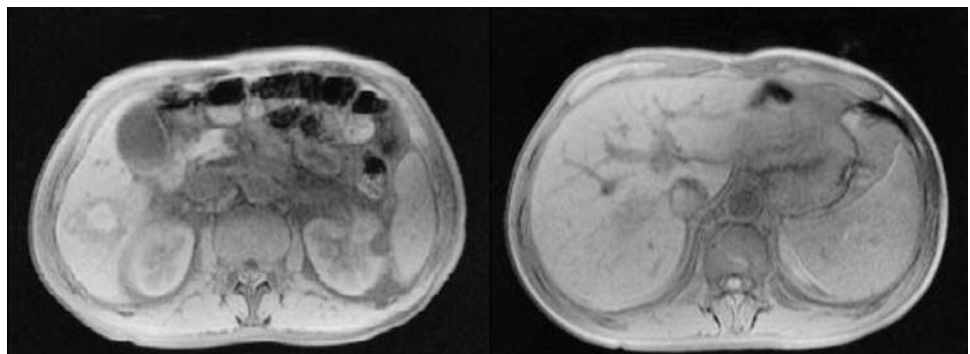


Fig. 1 The ventilation–perfusion lung scan showed multiple segmental perfusion defects at the first (A) and second (B) admissions

Fig. 2 Magnetic resonance imaging of the abdomen revealed a hepatoma about 4.5 cm in diameter over the inferior segment of the right lobe of the liver with direct invasion into the right hepatic vein and upward extension into the IVC



of the right lobe of the liver, with direct invasion into the right hepatic vein and upward extension into the IVC (Fig. 2). A transthoracic echocardiograph did not show the presence of a thrombus (Fig. 3A). A surgeon was consulted, but the patient refused further aggressive treatment.

One month after his first admission, he was able to walk without O₂ supplementation and was discharged. He developed acute respiratory failure after discharge and was admitted to our intensive care unit after endotracheal intubation. He was weaned from the ventilator 1 week later. The ventilation–perfusion lung scan was performed again and several new perfusion defects were noted (Fig. 1B). A transthoracic echocardiograph was performed again, and it showed the presence of a large thrombus of the right atrium (Fig. 3B). The surgeon was consulted again, following which the patient underwent right hepatectomy and removal of thrombi from the IVC and right atrium. He developed acute lung injury and died of multiple organ failure 3 days after the operation. The pathology report showed HCC complicated with tumor thrombi in the IVC and right atrium (Fig. 4).

Discussion

Acute pulmonary embolism as the first manifestation of HCC complicated with tumor thrombi in the IVC and right atrium is rare [1]. These patients usually die within a short period because of pulmonary embolism, heart failure, or cancer progression [2]. We have described a man who presented with acute pulmonary embolism. After a series of examinations, HCC complicated with tumor thrombi in the IVC and right atrium was disclosed. We searched the published English literature for reports of HCC with pulmonary embolism using the MEDLINE and PubMed databases (articles published between 1965 and July 2005). Fourteen patients were described in 10 articles (Table 1) [1–10]. The median age of patients with HCC and pulmonary embolism (including our case) was 48 years. Thirteen patients (87%) were male and two were female.

Clinical staging systems for HCC were recently described [11]. The staging systems most commonly used are the

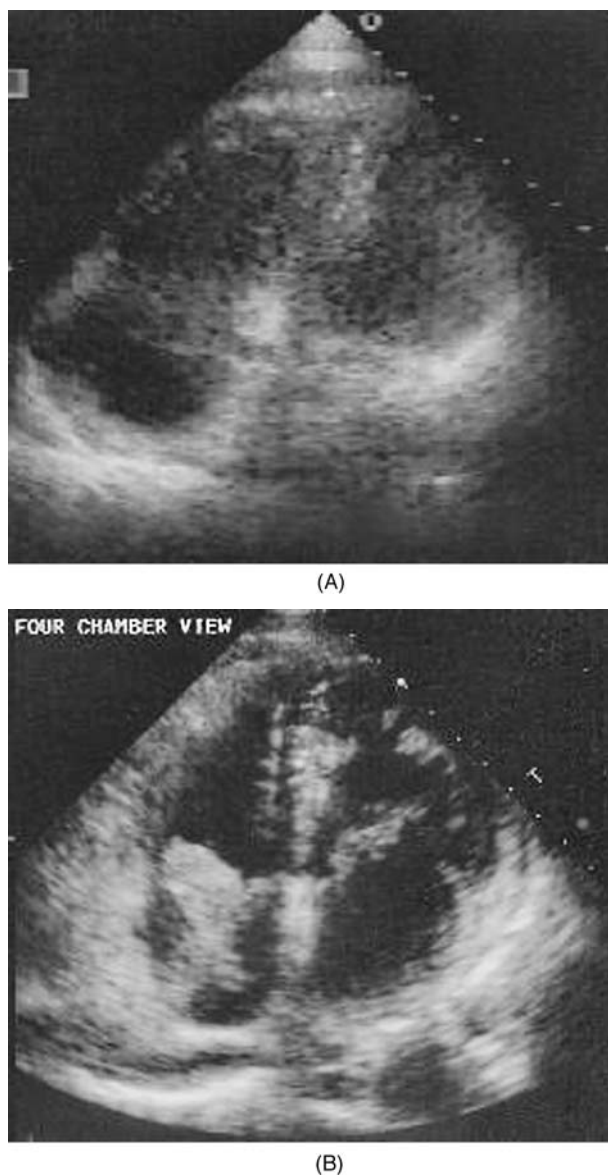


Fig. 3 The initial transthoracic echocardiograph did not show any thrombus (A) but a large thrombus of the right atrium was evident on subsequent admission (B)

Okuda system, the Child–Pugh classification, and the Cancer of the Liver Italian Program (CLIP) system. The CLIP system is the clinical staging system of choice [12]. We assessed the patients described in the literature using the Okuda system, Child–Pugh classification, and CLIP system (Table 1). There were sufficient data for eight of the patients to classify the clinical stage of their HCC. Four patients were classed as Okuda stage I, four as Okuda stage II, and none as Okuda stage III. Six patients were classed as Child–Pugh A, two as Child–Pugh B, and none as Child–Pugh C. Three patients were classed as CLIP score 1, four as CLIP score 2, one as CLIP score 3, and none as CLIP score 4–6. Most patients were at the early stage of HCC; 10 patients (67%) did not

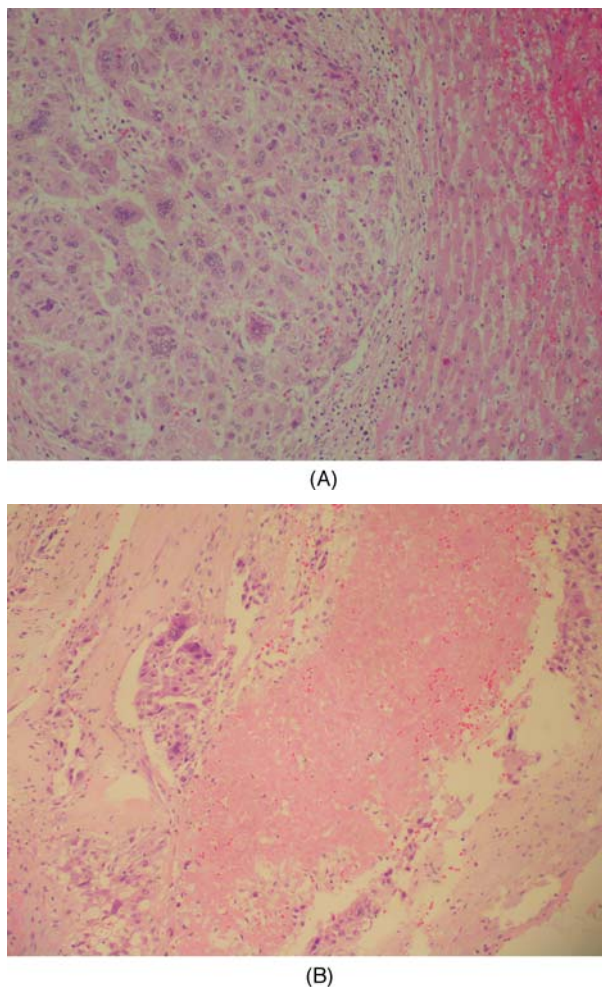


Fig. 4 Tumor cells in the liver (A) and thrombus of the right atrium (B). (Hematoxylin–eosin; [A] $\times 200$, [B] $\times 40$.)

even know that they had HCC when they presented to their physician.

Patients with HCC with tumor thrombi extending into the IVC and right atrium usually have a short life span because of the difficulty of early diagnosis [2]; our patient nearly died at home just after he was discharged. Some authors believe that hepatic resection with removal of the tumor thrombus is the only treatment [2]. Our patient initially refused surgery because of the great risk associated with the operation. After he developed acute respiratory failure, he agreed to undergo surgery. In our review of the literatures, of the five patients who underwent the operation (Table 1), two survived for more than a year, one survived for 8 months, and the other two died within 1 month of the operation. The median survival time of the nine patients who did not undergo surgery was 3 days and no patient survived for more than 2 months. The 1-year survival rates of patients with or without surgery were 40% and 0%, respectively. The median survival rate was related to surgery. Therefore, hepatic resection with removal

Table 1 Cases of hepatocellular carcinoma complicated with pulmonary embolism

Age	Sex	Okuda stage	Child–Pugh classification	CLIP score	Surgery	Outcome of surgery/ survival without surgery	Ref. No
63	M	I	A	2	Yes	Died in 1 mo	[1]
55	M	ND	ND	ND	Yes	Survived >12 mo	[3]
41	M	II	A	2	No	Survived 24 hr	[4]
30	F	II	A	2	No	Survived 5 hr	[5]
52	M	ND	ND	ND	No	Survived 12 hr	[6]
47	M	II	B	2	Yes	Survived 8 mo	[7]
48	M	I	A	1	Yes	Died in 1 mo	[7]
38	F	II	B	3	Yes	Survived >15 mo	[2]
63	M	ND	ND	ND	No	Survived 2 mo	[8]
35	M	I	A	1	No	Survived 5 days	[9]
34	M	ND	ND	ND	No	Survived 42 days	[10]
65	M	ND	ND	ND	No	Survived 3 days	[10]
28	M	ND	ND	ND	No	Survived 30 days	[10]
48	M	ND	ND	ND	No	Survived 2 days	[10]
57	M	I	A	1	Yes	Died in 1 week	This study

Note. CLIP, Cancer of the Liver Italian Program; ND, not described; M, male; F, female.

of tumor thrombi should be considered to prolong a patient's life span.

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