Successful Transcatheter Arterial Embolization for Hemothorax from a Spontaneous Rupture of Hepatocellular Carcinoma Metastasis to the Chest Wall in an Elderly Patient

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Abstract:

An 87-year-old man with hepatocellular carcinoma (HCC) presented with right-sided chest pain. Computed tomography revealed right bloody pleural effusion and an extravasation from an arterially enhanced mass in the right seventh posterior intercostal space. These findings indicated hemothorax from a rupture of HCC metastasis to the chest wall. Angiography of the intercostal arteries confirmed a hypervascular tumor, and transcatheter arterial embolization resulted in hemostasis. He was discharged with palliative care and remains alive after 9 months. Although hemothorax represents an unusual, life-threatening complication of HCC, our case suggests that transcatheter treatment can achieve hemostasis and a favorable survival even in elderly patients.

Key words: hepatocellular carcinoma, chest wall metastasis, spontaneous rupture, hemothorax, transcatheter arterial embolization

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Introduction

Hepatocellular carcinoma (HCC) accounts for the majority of primary liver cancer (1), which was estimated to have caused 841,100 incident cases and 781,600 mortalities worldwide in 2018 (2). A unique feature of HCC is the propensity to demonstrate a spontaneous rupture, which leads to hemoperitoneum (3, 4). The incidence of ruptured HCC is especially high in Asian countries (up to 26%) where the tumor is prevalent (3, 4). Although a rupture of HCC can cause severe conditions as a result of hemodynamic instability, a multimodal approach for the hemorrhage as well as the tumor has contributed to improving the management of such cases (3, 4). In addition, the aggressive behavior of HCC is demonstrated by frequent metastasis to other organs, such as the lung, lymph node, and bone (5-9). Metastatic HCC generally shows arterial enhancement on contrast-enhanced computed tomography (CT), similar to the primary tumor (5, 10). However, given the high prevalence and common extrahepatic spread of HCC, a rupture of the distant metastasis is considerably rare compared to that of the primary lesion. In particular, hemothorax, which results from a hemorrhage into the thoracic cavity, is an unusual presentation of HCC and it associated with a poor clinical outcome (11).

We herein describe a case of hemothorax secondary to spontaneous rupture of HCC metastasis to the chest wall, which was treated with transcatheter arterial embolization (TAE). Despite the advanced age of the patient, successful hemostasis and a relatively favorable survival were achieved.

Case Report

An 87-year-old man was admitted complaining of sudden-onset and persistent chest pain on the right side for 1 day.
The patient developed HCC in segment 6 of the liver and received percutaneous radiofrequency ablation 4 years prior. He experienced local recurrence at the ablated site 2 years prior to this presentation, which was treated with transcatheter arterial chemoembolization (TACE). While the residual tumor was not identified, hepatitis C virus was eradicated with sofosbuvir and ledipasvir therapy 1 year previously. Another course of TACE was performed for a 1.5-cm intrahepatic recurrence abutting the gallbladder 2 months ago. However, his serum des-γ-carboxy prothrombin (DCP) level increased from the 214 mAU/mL pretreatment to 251 mAU/mL posttreatment, whereas the serum α-fetoprotein level remained persistently normal.

On admission, his vital signs were a body temperature of 36.0°C, blood pressure of 102/69 mmHg, pulse rate of 96/min, and respiratory rate of 16/min with percutaneous oxygen saturation of 97% on room air. A physical examination detected decreased breath sounds in the right chest. Laboratory results indicated a decreased hemoglobin level from 12.9 g/dL (1 month ago) to 10.3 g/dL. No significant change was observed on electrocardiography.

Chest radiography in the supine position revealed diffuse infiltration in the entire right lung (Fig. 1). Non-contrast CT revealed massive right pleural effusion, the dorsal side of which showed a slightly high attenuation thus suggesting a hemorrhage (Fig. 2A). On dynamic CT, an arterially enhancing mass in the right seventh posterior intercostal space protruded into the thoracic cavity (Fig. 2B-D). A pinpoint extravasation was noted on the anterior surface of the lesion (Fig. 2C). There was no evidence suggesting an intrahepatic

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**Figure 1.** Supine chest radiography on admission showing diffuse infiltration in the right entire lung.

**Figure 2.** Thoracic computed tomography (CT) on admission. Non-enhanced CT revealed massive right pleural effusion, the dorsal side of which showed slightly high attenuation suggesting hemorrhage (A). Arterial phase (B, C) and late phase (D) of contrast-enhanced CT. An arterially enhancing mass in the right seventh posterior intercostal space was protruding into the thoracic cavity (B, C) (arrow), compatible with metastasis from hepatocellular carcinoma. A pinpoint extravasation was noted on the anterior surface of the lesion (C) (arrowhead), indicating a spontaneous rupture of metastatic hepatocellular carcinoma.
recurrence of HCC. These findings indicated hemothorax caused by a spontaneous rupture of HCC metastasis to the chest wall.

The patient refused chest drainage for the confirmation and management of hemothorax, but agreed to undergo transcatheter hemostasis for the chest wall lesion. Emergent angiography demonstrated a hypervascular tumor supplied predominantly by the right seventh intercostal artery (Fig. 3A) and partially by the right sixth intercostal artery (Fig. 3B), which was consistent with metastatic HCC. Although extravasation could not be identified on angiography, we performed selective embolization of these vessels using a gelatin sponge and microcoils based on the findings of contrast-enhanced CT. Post-embolization angiography of each artery confirmed complete disappearance of the tumor staining (Fig. 3C, D).

Following the treatment, his symptoms, such as fever, dyspnea, and chest pain, resolved conservatively. The hemoglobin and serum albumin levels decreased to the lowest levels of 7.9 g/dL and 2.7 g/dL, respectively, but blood transfusion or albumin supplementation was unnecessary. Because other liver function tests remained stable, these laboratory abnormalities were presumably caused by blood loss associated with hemothorax, not by hepatic decompensation. Although the thoracic metastasis was the only detected lesion of HCC, we withheld additional anticancer treatment because of his inadequate performance status and advanced age. The patient had been free of symptoms requiring management at the time of discharge, and we asked his primary care physician for future palliative care. While further radiological assessments were not performed, he visited our hospital with complete recovery of anemia and hypoalbuminemia 9 months after the onset of the hemothorax.

**Discussion**

This report highlights hemothorax as a complication of thoracic HCC metastasis in an elderly patient. To the best of our knowledge, no further case was reported after Yen et al. reviewed 21 cases with hemothorax from HCC referred to in the English literature (11). Notably, our patient was older than any of the previous cases. The most frequent symptoms of these cases were dyspnea followed by shock and chest pain (11). The HCC lesions responsible for hemothorax...
| No. | Author | Year | Age | Sex | Symptom | Responsible lesion | Feeding artery | Metastatic | Transcatheter treatment | Follow-up | Cause of death | Additional treatment | Cause of death |
|-----|--------|------|-----|-----|---------|-------------------|--------------|-----------|-----------------|-----------|-----------------|---------------------|---------------|
| 1   | Kohno (15) | 1990 | 53 | M   | Chest pain | Rib | Superficial cervical artery | Right and middle hepatic artery | TAE | 3 months | Dead | Cancer death | - | TAE |
| 2   | Kanai (27) | 1996 | 65 | M   | Cough, fatigue | Right and middle hepatic artery | Direct intraarterial injection | - | TAE | 40 days | Dead | Cancer death | - | TAE |
| 3   | Masuzaki (18) | 1997 | 64 | M   | Dyspnea, shock | Right and left hepatic artery | Right and left hepatic artery | Thromboembolic RFA | TAE | 3 months | Dead | Cancer death | - | TAE |
| 4   | Ishikawa (20) | 2002 | 59 | M   | Dyspnea | Right and left hepatic artery | Right and left hepatic artery | TAE | 40 days | Dead | Cancer death | - | TAE |
| 5   | Shiozawa (21) | 2006 | 68 | M   | Dyspnea, shock | Mediastinum (lymph node) | Mediastinum (lymph node) | TAE | 12 months | Dead | Cancer death | - | TAE |
| 6   | Ono (23) | 2012 | 56 | W   | Epigastric pain, shock | Chest wall | Mediastinum (lymph node) | TAE | - | Dead | ND | - | Radiotherapy |
| 7   | Nagai (13) | 2013 | 71 | M   | Dyspnea, shock | Chest wall | Mediastinum (lymph node) | TAE | 15 months | Dead | Cancer death | - | TAE |
| 8   | OH (24) | 2013 | 60 | M   | Dyspnea | Chest wall | Mediastinum (lymph node) | TACE | 4 months | Dead | Cancer death | - | TAE |
| 9   | Yen (11) | 2018 | 60 | W   | Dyspnea | Chest wall | Mediastinum (lymph node) | TAE | 9 months | Dead | Cancer death | - | TAE |
| 10  | Our case | 2019 | 87 | M   | - | Chest pain | Chest wall | TAE | - | Alive | - | - | - |

Overall, HCC complicated with hemothorax has an unfavorable prognosis. Death within a few months was frequently observed in previous cases primarily due to shock, organ dysfunction (particularly respiratory and liver failure), and cancer progression (11). This was also true of the cases achieving transcatheter hemostasis for hemothorax (11, 15, 18, 20, 24, 27), whereas 3 cases who survived for longer than 1 year received additional treatment for HCC (13, 21, 23). Based on these findings, it is remarkable...
that our patient survived at least 9 months after undergoing TAE alone, although no further anticancer therapy was applied partly because of his highly advanced age. Thus, our case suggests that TAE for hemothorax from ruptured HCC metastasis can lead to hemostasis and favorable survival outcome even in the elderly.

One possible explanation for the relatively long-term survival in our patient was the low primary tumor burden. It has been shown that the intrahepatic tumor status predicts the prognosis of patients with extrahepatic metastasis of HCC (8, 9). However, metastatic HCC is generally associated with severe intrahepatic tumor condition (5-7). This finding is consistent with many previous reports describing that hemothorax from metastatic HCC occurred in cases with large and multiple primary lesions as well as repeated history of treatment for recurrence (11, 16, 21, 22, 24, 26).

In contrast, the intrahepatic lesion of our patient was well controlled despite sporadic locoregional therapies. In patients with localized intrahepatic HCC treated by transcatheter therapies, extrahepatic metastasis is not the major form of disease progression (28). For this reason, we hardly anticipated the development of extrahepatic metastasis in our patient, although an increased serum DCP level after the latest course of TACE can be attributable to the chest wall lesion. Therefore, our case shows that thoracic metastasis and resulting hemothorax can occur even in a case with a low intrahepatic tumor burden. At present, however, it is unclear which population with HCC is most at risk of this unusual event, and thus may benefit from careful monitoring for extrahepatic metastasis.

In summary, we herein described a case of hemothorax resulting from spontaneously ruptured HCC metastasis to the chest wall. Although this life-threatening complication of HCC can occur in cases with a well controlled primary tumor status, TAE is an effective treatment that can lead to hemostasis and a favorable survival even in the elderly.

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Informed Consent
The patient provided written informed consent for the publication of this article and accompanying images.

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