

Successful Management of Pulmonary and Inferior Vena Cava Tumor Embolism from Renal Cell Carcinoma

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Pulmonary tumor embolism can be a cause of respiratory failure in patients with cancer even though it occurs rarely. We describe a 56-year-old man who underwent a pulmonary tumor embolectomy using cardiopulmonary bypass on beating heart combined with inferior vena cava embolectomy and right radical nephrectomy. Aggressive surgical treatment in this severe case is necessary not only to reduce the fatal outcome of pulmonary embolism in the short run, but also to improve the oncological prognosis in the long term.

Key words: 1. Pulmonary embolism
2. Cancer
3. Great vessels
4. Embolectomy

CASE REPORT

A 56-year-old man who had a 2-month history of shortness of breath was presented to a local clinic with a sudden onset of chest pain. He was transferred to the local hospital and was tested. Physical examination revealed tachycardia and mild tachypnea. Coronary arteriography showed normal coronary arteries. The next day, a chest computed tomography (CT) was performed and heavy burden of pulmonary emboli in bilateral pulmonary arteries and branches were shown (Fig. 1A). An abdominal CT revealed a large mass in the right kidney (Fig. 1B) and a thrombus in the right renal vein extending into an inferior vena cava (IVC) (Fig. 1C). Echocardiography showed mild to moderate tricuspid regurgitation with mild pulmonary hypertension. Low molecular weight

heparin was initiated and the patient was admitted to Samsung Medical Center. Seven days later, the patient underwent a right radical nephrectomy, a resection of the extended tumor in the abdominal IVC and a pulmonary embolectomy in one session. The right radical nephrectomy was performed via laparotomy first. At the same time, the lower abdominal IVC was exposed to insert venous cannula to run the heart-lung machine. In succeeding, through a median sternotomy, ascending aortic arterial cannulation and triple venous cannulation of superior vena cava, thoracic IVC, and infra-renal IVC were made. On beating heart under cardiopulmonary bypass, resection of the extended tumor in the abdominal IVC was performed (Fig. 2A). And then, emboli in the left pulmonary artery and its branches were pulled out with forceps via left pulmonary arteriotomy following vent

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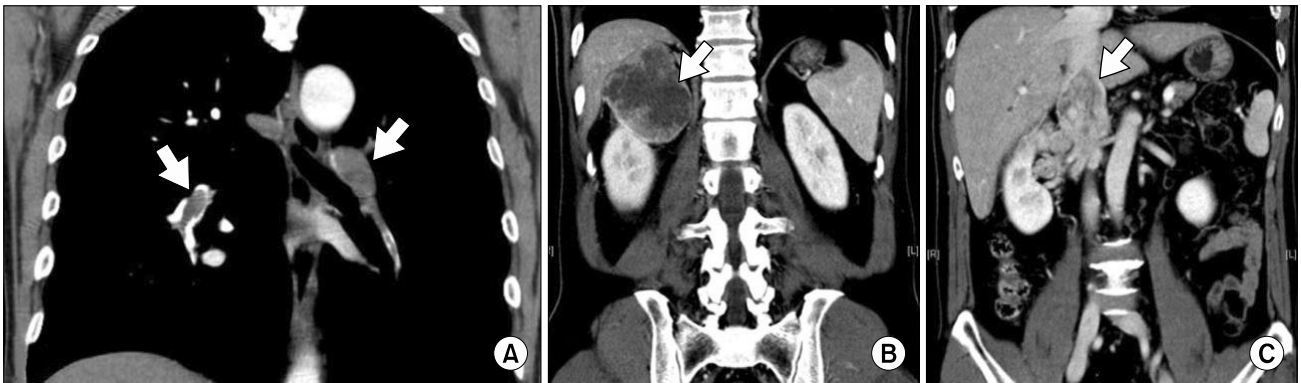


Fig. 1. (A) Chest computed tomography shows filling defects in the pulmonary arteries, characteristic of pulmonary embolism. (B) A large mass in the upper pole of right kidney. (C) The thrombus is detected as a hypodense filling defect within the contrast enhanced inferior vena cava.

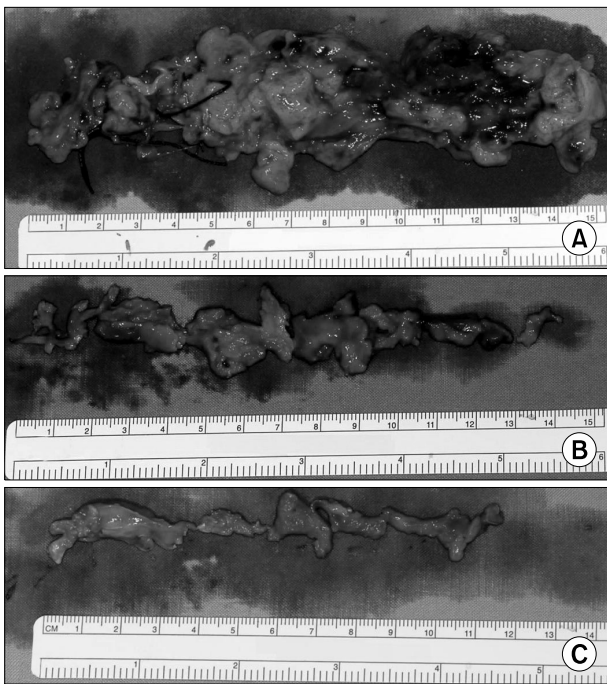


Fig. 2. (A) Specimens removed from the inferior vena cava, (B) the left pulmonary artery and (C) the right pulmonary artery.

catheter insertion into right ventricle through proximal main pulmonary artery with distal main pulmonary artery snaring (Fig. 2B). The emboli on the other side were removed with same manner via right pulmonary arteriotomy (Fig. 2C). After primary repair of both pulmonary arteries, cardiopulmonary bypass was weaned off. Total cardiopulmonary bypass time was 208 minutes. The renal mass was proved to be renal cell

carcinoma. Thrombi in abdominal IVC and pulmonary arteries were confirmed as tumor emboli of renal cell carcinoma. Seventeen days after the surgery, the patient was discharged without any complications. In the follow-up chest CT taken one week after operation, most of emboli were removed except tiny remnant in the left lower lobe posterobasal segmental pulmonary artery (Fig. 3A). Two months after operation, positron emission tomography-CT (Fig. 3B) and magnetic resonance imaging (Fig. 3C) showed single metastatic liver mass, but no pulmonary metastasis. Patient underwent radiofrequency ablation of liver mass. And the mass was completely destroyed. No further treatment was recommended by oncologist other than regular follow-up.

DISCUSSION

While pulmonary tumor embolism occurs rarely, it can be a cause of respiratory failure in patients with cancer. It is not easy to differentiate tumor embolism from the more common thrombotic embolism on clinical grounds since they have similar symptoms. Such an embolism may appear at any stage of the patient's illness and may even be the first presentation of an occult carcinoma [1]. Tumor pulmonary embolism is thought to be a filtered tumor during seeding the systemic circulation with individual cells or cell clusters [2]. Tumor embolism of large fragments is rare but has been reported in chondrosarcoma, renal cell carcinoma, right atrial myxoma, and Wilms' tumor [2]. It presents as an acute event



Fig. 3. (A) Tiny remnant remained in the left lower lobe posterobasal segmental pulmonary artery. (B) Single metastatic liver mass was found in positron emission tomography-computed tomography and (C) in magnetic resonance imaging two months after operation. However no pulmonary metastasis was shown.

with symptoms of massive pulmonary embolism including dyspnea, chest pain accompanied by hypoxemia, and acute cor pulmonale with hemodynamic collapse [2]. Microvessel tumor emboli have been reported more frequently. Common sources of such emboli are liver, breast, stomach, renal and prostatic cancers and choriocarcinoma [1-3]. The clinical presentation of such embolism is typically subacute. Dyspnea develops over days to weeks and is sometimes accompanied by chest pain, cough, and hemoptysis [2].

In this case, renal cell carcinoma extended into IVC and made emboli at both pulmonary arteries and its branches. The classic triad of flank pain, hematuria, and abdominal mass is present in only approximately 15% of patients who are diagnosed with renal cell carcinoma. Rarely, pulmonary embolism can be the initial manifestation of renal cell carcinoma [4]. Such an embolus originates in tumor involvement of the renal vein (33%), with extension to the inferior vena cava in 6% of cases [5]. To prevent worsening the patient's condition, a proper treatment including embolectomy is necessary as soon as possible to reduce fatal events. Interestingly, tumor emboli do not always lead to pulmonary metastasis. The establishment of pulmonary metastasis requires not only mechanical trapping of carcinoma cells in pulmonary vasculature, but an invasive potential of the cells themselves and appropriate microenvironment to enhance the local growth of cells [6]. Extension of renal cell carcinoma through the venous drain is not a sign of aggressiveness of the tumor. Metastatic behavior of the tumor is more important than the level of embolus in determining the prognosis [7]. Although liver metastasis was

found in this patient after operation, the metastatic mass was removed completely with simple intervention and pulmonary metastasis did not exist in spite of pulmonary embolism. Therefore, aggressive approach towards total resection of renal tumor and emboli improves the prognosis of patients as well as resolving the respiratory problems.

In conclusion, this severe case requires surgical pulmonary embolectomy for positive prognosis in the long term from an oncological view in addition to reducing fatal outcome in the short run.

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