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Case Report / Olgu Sunumu

Surgical treatment of massive pulmonary thromboembolism due to renal cell carcinoma

Renal hücreli karsinoma bağlı masif pulmoner tromboembolinin cerrahi tedavisi

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ABSTRACT

While renal cell carcinomas frequently invade the renal vein and inferior vena cava, the right atrial extension or formation of bilateral pulmonary massive embolism is quite unusual. A 65-year-old male patient underwent bilateral pulmonary tumor endarterectomy and total thrombectomy of the inferior vena cava combined with left nephrectomy under total circulatory arrest with antegrade cerebral perfusion. Both mediastinal and abdominal approaches facilitated the complete removal of the caval thrombus under the guidance of transesophageal echocardiography. The patient is still under follow-up for six months without metastasis. In conclusion, pulmonary thromboembolism due to renal cell carcinoma is rare, surgical treatment is possible.

Keywords: Inferior vena cava, pulmonary embolism, renal cell carcinoma.

ÖZ

Renal hücreli karsinom, renal veni ve inferior vena kavayı sıklıkla invaze ederken, sağ atriyuma ilerlemesi veya iki taraflı pulmoner masif emboliye neden olması oldukça nadirdir. Altmış beş yaşında erkek hastaya total dolaşım arresti altında ve antegrad serebral perfüzyon kullanılarak eş zamanlı sol nefrektomi ile birlikte iki taraflı pulmoner tümör endarterektomisi ve inferior vena kavanın total trombektomisi yapıldı. Transözefageal ekokardiyografinin kılavuzluğu altında her iki mediastinal ve abdominal yaklaşım, inferior vena kavadaki trombüsün tamamen çıkarılmasını kolaylaştırdı. Hasta altı aydır halen metastaz olmaksızın takip edilmektedir. Sonuç olarak, renal hücreli karsinoma bağlı pulmoner tromboembolizm nadir görülmekle birlikte, cerrahi tedavisi mümkündür.

Anahtar sözcükler: İnferior vena kava, pulmoner emboli, renal hücreli karsinom.

Renal cell carcinomas (RCCs) are a heterogeneous group of urological cancers and represents approximately 2 to 3% of all tumors.[1,2] Invasion of major vascular structures such as inferior vena cava (IVC) is seen in 4 to 10% of the patients with RCC and associates with poor prognosis.[3] Tumor embolism into pulmonary arteries resulting in chronic pulmonary hypertension has been reported to occur very rarely.[4] In the literature, pulmonary thromboembolism (PTE) caused by RCC rarely contains tumor cells. In this article, we report a case of PTE material mostly contained tumor cells.

CASE REPORT

A 65-year-old male patient presented to our hospital with new-onset hematuria and dyspnea. Thoracoabdominal computed tomography (CT) revealed a large left renal mass (14×18 cm in diameter).

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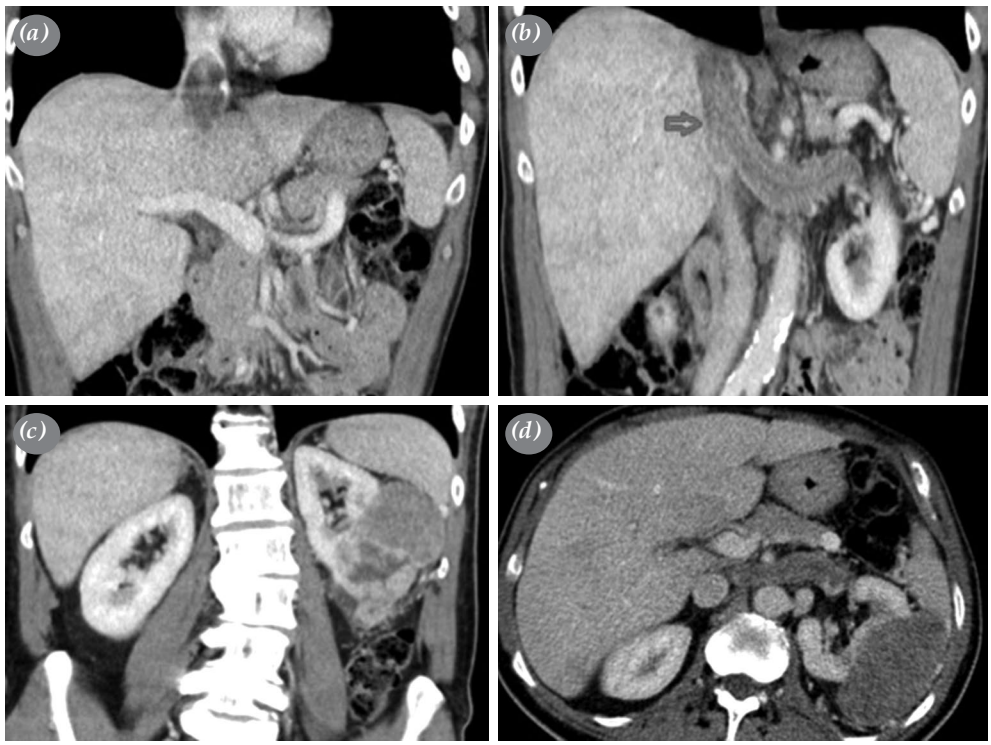

Figure 1. Preoperative computed tomography examination of left renal mass and inferior vena cava tumor thrombus.

The tumor was seemed to have the caval invasion with extending to the level of the cava-atrial junction (Figure 1). Thoracic CT revealed bilateral mosaic attenuation pattern. Transthoracic echocardiography revealed dilation of the right ventricle with flattening of the interventricular septum. The estimated systolic pulmonary artery pressure was around 55 mmHg on pulmonary CT angiography, occlusion of the right and left pulmonary arteries was detected (Figure 2a). The patient underwent a concomitant surgical treatment of with bilateral pulmonary artery tumor endarterectomy in addition to left radical nephrectomy.

Median laparotomy was performed and the left renal mass was removed. The great attention was paid during the surgical manipulation of the IVC to prevent iatrogenic embolism of the intravascular tumor material intraoperatively. The axillary artery and the femoral vein cannulation was established for cardiopulmonary bypass (CPB). Then, median sternotomy was performed and the superior vena cava was also cannulated. The CPB was instituted and the patient was cooled down to 25°C degrees. During cooling, the IVC was occluded with a Dacron® snare to prevent the mobilization of the caval thrombus.

The caval tumor thrombus was completely removed under cardiac arrest and moderate hypothermia (25°C) via transatrial and transabdominal approach (vertical cavatomy). The most challenging part of the caval thrombus was at the region around the hepatic veins. The surgeon's both index fingers facilitated the removal of the remaining tumor material under transesophageal echocardiography guidance. Total circulatory arrest with antegrade cerebral perfusion was instituted. The left and right pulmonary arteries were opened respectively and the tumor thrombus was completely removed (Figure 2b). Postoperative course was uneventful and the patient was discharged from hospital on postoperative Day 5. In the control CT, both pulmonary arteries and vena cava inferior were patent without residual tumor or thrombus six months after operation (Figure 2c). In pathological examination, the renal mass was consistent with RCC. Pulmonary thromboendarterectomy material revealed that the thrombotic material was mixed with the tumor cells (Figure 2d, e).

DISCUSSION

In RCCs, invasion of IVC has been shown to be an independent adverse prognostic factor.[3] Pulmonary tumor embolization has been very rarely reported

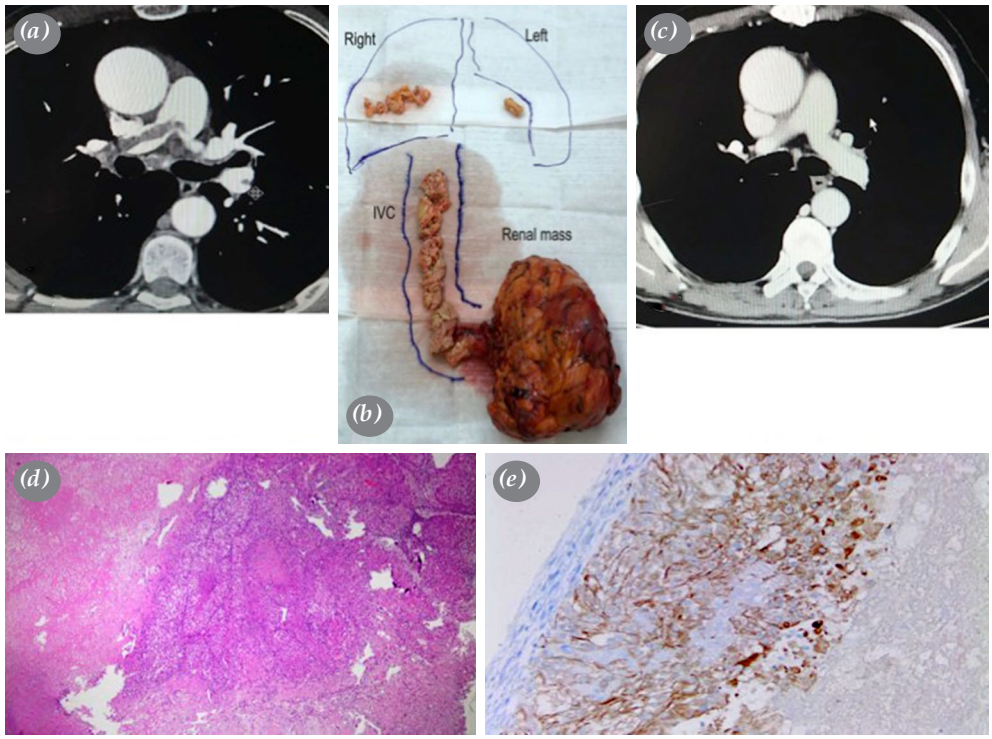

Figure 2. **(a)** Preoperative pulmonary CT angiography. **(b)** Gross pathological material of renal mass, vena cava thrombectomy material and pulmonary endarterectomy material. **(c)** Postoperative control pulmonary CT angiography. **(d)** Pathological view of pulmonary thrombus mixed with the tumoral cells (H&E, ×100). **(e)** Immunohistochemical staining of the thrombotic material (Pancytokeratin ×200).
CT: Computed tomography.

(0.9%) in patients with RCC.[5] González et al.[6] reported that, in most cases, PTE is produced by a mixture of tumor and bland thrombus fragments.

Paw and Jamieson[4] found that the chronic nature of the tumor embolism provoked the development of vessel wall inflammation and fibrosis, a true pulmonary endarterectomy was needed rather than a simple pulmonary embolectomy. In the present case, pathological examination of the chronic PTE revealed a mixture of benign thrombus with tumoral cells. The PTE at the right pulmonary artery necessitated a true endarterectomy due to the intimal fibrosis and inflammation, as described by Paw and Jamieson[4] We performed pulmonary endarterectomy under moderately hypothermic circulatory arrest with antegrade cerebral perfusion. However, if PTE is not in chronic stage, excision of PTE can be performed under normothermic CPB alternatively.[5]

Thoracoabdominal approach and hypothermic CPB is a prerequisite for complete extirpation of the tumor in cases with pulmonary tumor embolism. However, the adverse effects of CPB or deep hypothermic circulatory arrest have been shown to be detrimental in these patients; therefore, staged procedure either nephrectomy or pulmonary thrombectomy first has been reported, but concomitant surgery is preferred to shorten the ventilation time and reduce surgical complications.[5] Based on our experience, moderate hypothermic CPB with the clamping of infrarenal IVC provides a satisfactory exposure of the intrahepatic IVC through both the cava-atrial junction and infrahepatic cavatomy.

Another important reason for performing pulmonary endarterectomy is that PTE material may also contain malignant cells which may cause pulmonary metastases or distant metastases.[7] Renal cell carcinomas may be presented with pulmonary embolism which is associated with end-organ metastasis and poor survival.[8]

In conclusion, synchronous pulmonary artery endarterectomy and inferior vena cava thrombectomy can be performed under cardiopulmonary bypass

safely with satisfactory results. Complete removal of the pulmonary tumor embolus via pulmonary thromboembolism can provide future benefit in the limited survival related to tumor dissemination.

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Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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