

## Simultaneous nephrectomy, intracaval and right atrial tumor excision, caval patchplasty and coronary artery bypass grafting in patient with renal cell carcinoma

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The most common type of tumor occupying the inferior vena cava and extending to the right atrial cavity is renal cell carcinoma. Herein, we report a 54-year-old male patient with renal cell carcinoma with a tumor extending into the inferior vena cava and right atrium along with coronary artery disease. The patient successfully underwent simultaneous nephrectomy, intracaval and right atrial tumor excision, caval patchplasty and coronary artery bypass grafting under normothermic cardiopulmonary bypass without cross clamping or cardioplegic arrest. To the best of our knowledge, this is the first case reported in the literature in whom all the operations were performed simultaneously.

Keywords: Cardiopulmonary bypass; coronary bypass; nephrectomy; renal cell carcinoma; right atrial mass; tumor.

The most common type of tumor occupying the inferior vena cava and extending to the right atrial cavity is renal cell carcinoma (RCC). The rate of such extension in RCCs has been reported to be 4 to 25%.<sup>[1]</sup> Renal cell carcinomas were classified into four categories preoperatively according to the level of thrombus extension in the inferior vena cava starting from the infrahepatic renal vein (Stage 1) to the right atrium (Stage 4). The coexistence of the right atrial thrombus (Stage 4) is less than 1%.<sup>[2-4]</sup>

In patients with non-metastatic RCC who underwent radical nephrectomy and complete thrombectomy, five-year survival rates of 30% to 72% have been reported.<sup>[1]</sup> However, surgical indication for patients with metastatic RCC and the use of cardiopulmonary bypass (CPB) during vena caval thrombectomy are still controversial.<sup>[1]</sup> The risk of CPB use may be a possibility of tumor dissemination; however, some reports indicated that the use of extracorporeal circulation during the resection of tumor thrombus in the inferior vena cava did not affect the long-term survival.<sup>[5]</sup> A very small percentage of non-metastatic RCC patients die from the surgical intervention and postoperative complications.<sup>[1-4]</sup> The presence of metastasis at the time of surgery significantly is associated with a poor survival.<sup>[6]</sup> Atrial extension of the tumors is associated with a significantly higher risk of the development of metastatic spread, but not with significantly increased risk of operation.<sup>[6]</sup> Some reports have shown that

adjuvant medical therapy combined with surgery may increase the survival of RCC patients with distant metastases.<sup>[2-4]</sup>

Concomitant disorders such as coronary artery disease may also accompany in patients with RCC.<sup>[4]</sup> Additional coronary artery bypass grafting (CABG) surgery may be required for such patients like as in our case.

### CASE REPORT

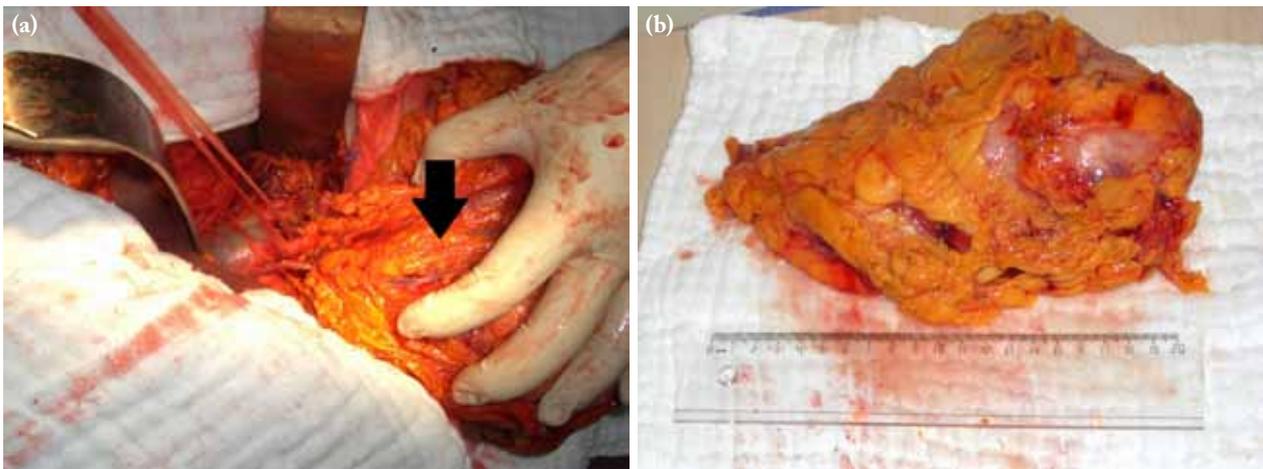
A 54-year-old male patient was admitted to our hospital with syncope, angina, right flank pain, hematuria and weight loss. Electrocardiography revealed sinus rhythm, left axial deviation and ischemic pattern in precordial leads. A huge renal tumor mass was identified using abdominal ultrasound, while the tumor and thrombus extension were detected using abdominal computed tomography and transthoracic echocardiography. The tumor and thrombus were extended to the right atrial cavity. Tumor extension was on Stage 4. Radiological examination showed no metastatic spread. Coronary angiography revealed a

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**Figure 1.** Images showing (a) a renal tumor mass and (b) nephrectomy specimens after resection.

99% stenosis on the proximal left anterior descending artery.

We performed simultaneous nephrectomy, intracaval and right atrial tumor excision, caval patchplasty and CABG under normothermic CPB without cross clamping or cardioplegic arrest. The patient was discharged from the hospital uneventfully in the eight postoperative day. His overall condition is currently stable.

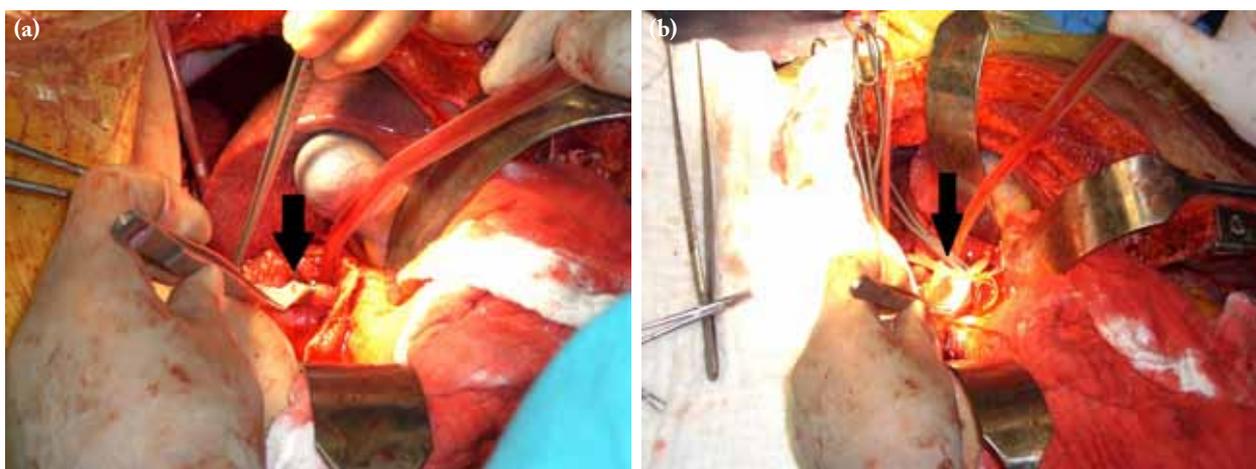
### Surgical technique

Chevron incision and median sternotomy were used together for simultaneous operation. Radical nephrectomy was performed first via retroperitoneal approach (Figures 1a, b). After radical nephrectomy, heparin was given at a dose of 300 IU/kg before CPB. An aortic cannula was inserted to the ascending aorta. Venous drainage was achieved using a proximal cannula inserted to the superior vena cava and a distal cannula inserted to the inferior vena cava below renal veins through a femoral vein. Superior vena cava, intrapericardial and infrarenal inferior vena cava were encircled with tapes and CPB was initiated. Before opening the right atrium, superior vena cava and infrarenal inferior vena cava snares were snugged and right atrium was opened with conventional oblique incision. Right atrial tumor and thrombus were extracted under normothermic CPB without cross clamping or cardioplegic arrest (on-pump beating heart). During the tumor excision, venous return from the hepatic veins and contralateral renal vein were aspirated from the right atrial cavity by coronary suction. The whole tumor and thrombus were able to be extracted without any fragmentation through the right atrial cavity (Figure 2).

After the tumor and thrombus extraction through the right atrial cavity, intrapericardial inferior caval snare was snugged and infrarenal caval snare was released and then the right atrial cavity was closed. After the closure of atrial incision, dual vascular clamping was applied in the infrahepatic and suprarenal segment of vena cava (Figure 3a). Vena cava between these areas was reconstructed with a Dacron graft due to the invasion of the vein wall preserving the contralateral renal vein (Figure 3b). Finally, the left anterior descending artery was revascularized with saphenous vein grafting. No difficulties were encountered in weaning from extracorporeal circulation.



**Figure 2.** Complete material of vena cava and right atrial tumor thrombus extracted without any fragmentation. Non-fragment material matching the first 10 cm of the vena caval portion and between 10-11 cm fits the diaphragmatic portion, the rest of the material after 11 cm belongs right atrial portion of the tumor thrombus.



**Figure 3.** (a) Resection of the tumor invading the infrahepatic and suprarenal segment of vena cava and (b) reconstruction with a Dacron graft of this vascular segment.

## DISCUSSION

Renal cell tumors with thrombi in the right atrium require immediate surgical treatment. However, there is no consensus regarding the surgical technique of choice.<sup>[1-7]</sup> The major critical factor is successful surgery, mainly managing the interior vena cava. The main goals are to minimize bleeding and prevent embolism from the thrombus during surgery.<sup>[4]</sup> In addition, CPB may be required in patients with a bulky, intraatrial thrombus.<sup>[8]</sup> However, those with a minimal and non-adherent atrial thrombus may not require CPB.<sup>[9]</sup> The choice of a circulatory support technique consisting of either normothermic perfusion with venous drainage or total circulatory arrest with profound hypothermia has not been defined yet. The main variables to be considered in choosing the most appropriate method are the surgeon's personal preference and experience. An increased CPB time and the use of deep hypothermia in circulatory arrest may result in a several well-known complications such as hemorrhage, neurological dysfunction, and organ failures. Similarly, our patient had a 99% LAD stenosis. In the light of the literature data, we performed simultaneous nephrectomy, intracaval and right atrial tumor excision, caval patchplasty and CABG under normothermic CPB without cross clamping or cardioplegic arrest.<sup>[7]</sup>

To the best of our knowledge, this is the first case reported in the literature in whom all the operations were performed simultaneously.

## Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

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