

Case Report

Renal Cell Carcinoma with Inferior Vena Cava Thrombus: A Case Report

Md Anisuzzaman¹, Nazmul Hosain¹, Zulfiqar Rashid²

¹Department of Cardiac Surgery, Chittagong Medical College & Hospital, Chattogram, ²Department of Cardiac Surgery, NICVD, Dhaka

Abstract:

The incidence of venous extension to the inferior vena cava (IVC) of renal cell carcinoma (RCC) is markedly increased recently mostly due to the advances in diagnostic modalities. Such vascular invasion implies a heightened biologic behavior and a surgical challenge during the course of treatment. Here we discussed a case with study of the classification guidelines, recent diagnostic tools and up-to-date therapeutic modalities for RCC with IVC tumor thrombi. Also added to the discussion are the prognostic significance regarding the pathologic nature of vascular invasion, cephalad extent of thrombi and any associated distant metastasis.

(Cardiovasc j 2022; 15(1): 111-115)

Key Words :
Renal cell carcinoma

Introduction:

Venous migration and tumor thrombus formation are unique aspects of renal carcinoma with significant therapeutic and prognostic implications. It has been reported to occur in 4 to 10% of patients with renal neoplasms. Within this group, 2 to 16% have tumors extending into the right atrium. The tumor thrombus may invade the caval wall which is difficult to predict preoperatively.

We studied the tumor, its caval thrombus and cephalad extent of venous system according to the traditional classification (Fig-1).¹

- Level-I : Tumor thrombus when extend into the ipsilateral renal vein only.
- Level-II : Tumor thrombus when enter into the IVC and cephalad extension up to infrahepatic IVC.
- Level-IIIa : (intrahepatic) A tumor thrombus extending into the retrohepatic IVC but below the ostia of major hepatic veins.

Level-IIIb : (hepatic) Tumor thrombus extended into the retro-hepatic IVC reaching the ostia of the major hepatic veins may extend into them causing Budd-Chiari syndrome.

Level-IIIc : (suprahepatic, infradiaphragmatic) Tumor thrombus extending into the retrohepatic IVC above the major hepatic veins but below the diaphragm.

Level-IIId : (suprahepatic, supradiaphragmatic and infra-atrial) Tumor thrombus extending into the supradia-phragmatic, intrapericardial IVC but not into the right Atrium.

Level-IV : Right atrial tumor thrombus.

Progressive rising incidence of renal cell carcinoma has in part been attributed to early detection of tumors by the widespread use of abdominal imaging modalities as ultrasonography, computed tomography (CT) and magnetic resonance imaging (MRI). The overall goal of preoperative imaging is

Address of Correspondence: Dr. Md Anisuzzaman, Department of Cardiac Surgery, Chittagong Medical College, Chattogram, Bangladesh. E-mail: aniscts10@gmail.com.

© 2022 authors; licensed and published by International Society of Cardiovascular Ultrasound, Bangladesh Chapter and Bangladesh Society of Geriatric Cardiology. This is an Open Access article distributed under the terms of the CC BY NC 4.0 (<https://creativecommons.org/licenses/by-nc/4.0>)

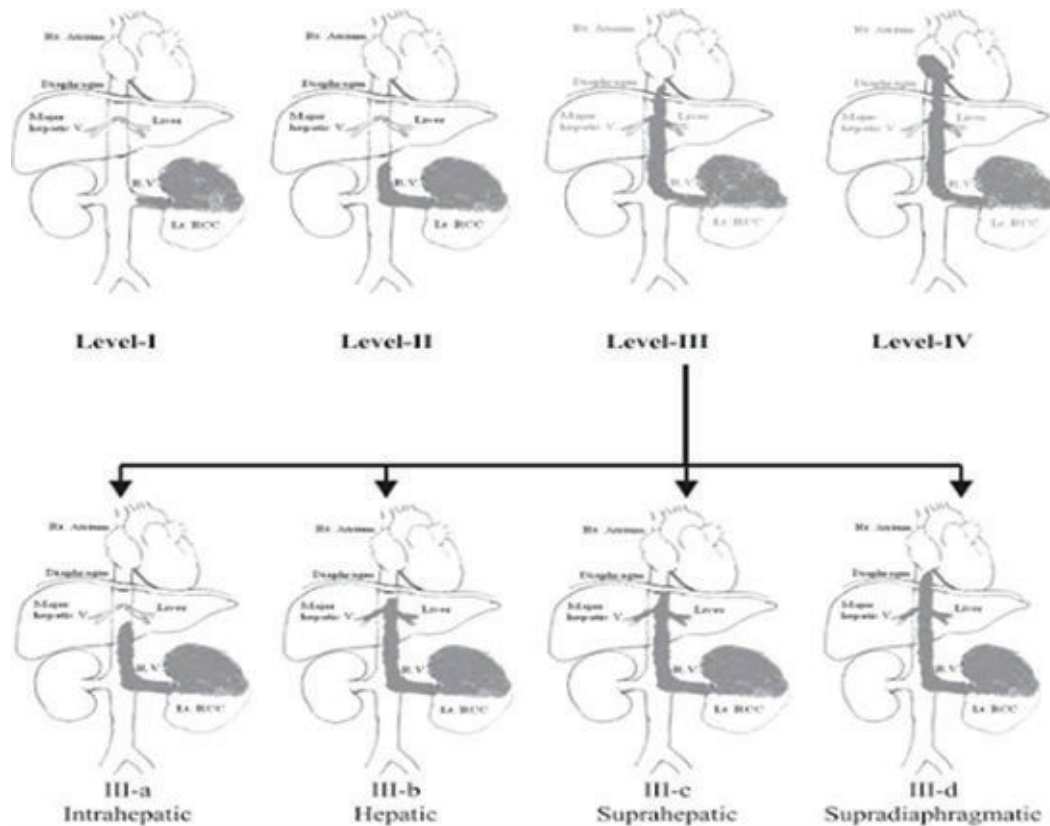


Fig-1: Traditional classification of RCC caval thrombus.

to determine the malignant potential of the lesion, assess tumor size and location, determine capsular invasion, and identify regional lymphadenopathy or metastases for accurate staging. In addition, the renal vein and IVC need to be assessed for tumor thrombi.²

Ultrasonography is the first imaging modality used to evaluate patients with RCC (renal cell carcinoma). However, its sensitivity in detecting tumor thrombi depends on the position of the thrombus with a lower sensitivity for infrahepatic (68%) than for suprahepatic thrombi (100%).³

CT scan is extremely useful in demonstrating the cephalad extent of the thrombus and occult metastasis in the majority of cases. Contrast enhancement of renal vein shows low density filling defect within the vein. Conventional CT has a low sensitivity in delineating the superior margin of the thrombus when compared to MRI (76% & 100% respectively).

Currently MRI is the gold standard for delineating the level and extent of tumor thrombus in the IVC

and staging of RCC with a sensitivity of 96-100% and it may rule out caval wall invasion, so the exact surgical procedure can be planned. The diagnostic effect of PET is dependent on the abnormal uptake of 18-fluoro 2-deoxy glucose (FDG) by the tumor tissue, so there are some drawbacks.⁴

Duplex study and transoesophageal echocardiography can be performed pre and intraoperatively to confirm the cephalad extent of tumor thrombus and to evaluate cardiac function especially level III-d & IV thrombi.⁵

Objectives of surgery were complete resection of tumor and its caval thrombi, prevention of tumor embolism, minimizing blood loss, maintenance of hemodynamic stability and prevention of vital organ ischemia.

Case report:

A 23 years old boy admitted in Ibn Sina Medical College Hospital with the complain of Lump/ mass in the abdomen for six months and abdominal pain

for 02 months. On examination the boy was anxious but otherwise normal. His pulse was 78/min, BP-120/80 mm Hg, respiratory rate 12/min. On abdominal examination a 10cmX8cm mass was delineated which was firm in consistency, mobile, nontender in the left loin. And no ascites was seen. On investigation, Hb % 10.8 gm/dl, ESR 25, RBS 5.2 mmol/L, Serum Creatinine 0.9 mg/dl, S bilirubin normal, SGPT was normal, viral markers (HBsAg, HCV, HIV) were negative, chest X-ray was normal, ECG was normal.

And blood grouping and Rh typing done and was A-positive.

On ultrasonography showed 12cm X 10cm mass arising from left kidney, vascular invasion and Para aortic lymphadenopathy could not be delineated, no ascites was seen.

Computerized Tomography showed left renal mass 13.5cm X 9.8cm X 11.5cm (AP X TD X Vertical Length). Extension to left renal vein and inferior

vena cava (subhepatic) ie. Level II. Extension through renal capsule and extension to gerota fascia both were positive. Para aortic lymphadenopathy (multiple) positive (Fig-2).

Renal angiogram showed two renal veins noted at left side. Upper left renal vein showed irregular filling defect in whole length and extending up to inferior vena cava where oval shaped filling defect noted. Lower left renal vein showed linear filling defect within the lumen and communicated posteriorly with the vertebral venous plexus at L 2 level. Right renal vein was normal.

Surgical approach: With all aseptic precaution and under general anesthesia abdomen was opened through rooftop incision (bilateral subcostal incision). At first left nephrectomy done with gentle handling to minimize bleeding and tumor shedding and more importantly to prevent pulmonary embolism by dislodging the inferior vena cava thrombus (Fig-3A).

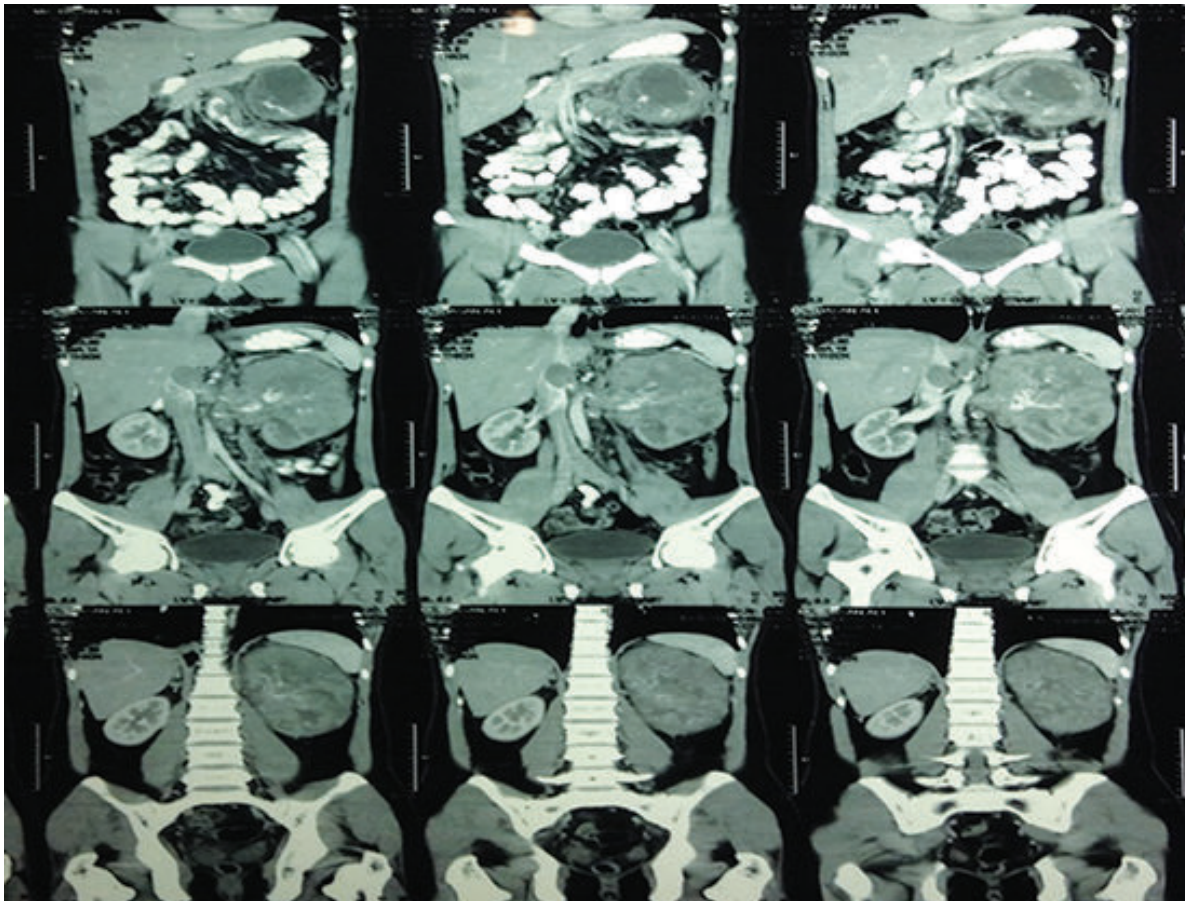


Fig.-2: CT Scan shows level-II tumor thrombus with left renal mass(RCC).

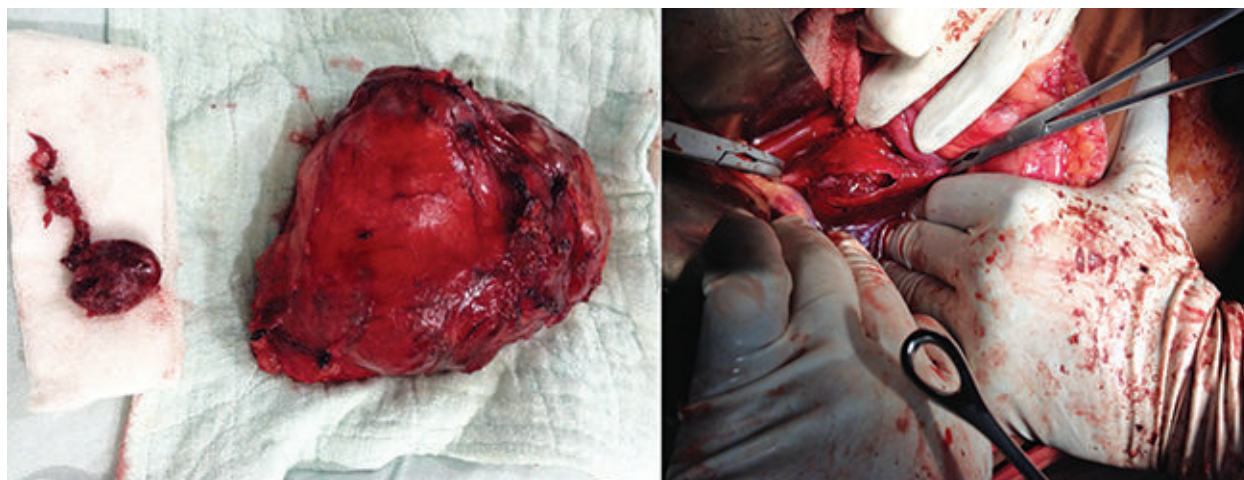


Fig- 3: 3A-Left renal mass(RCC) and IVC tumor thrombus, 3B- IVC tumor thrombus seen through incision of IVC.

Then we softly clamped the cut end of the left renal vein and ligate the renal artery. And removed the enlarged lymph nodes at the vicinity of renal mass. Ensuring hemostasis, the space packed with worm mop and go for vena cava control. The upper limit of IVC thrombus was infrahepatic (Level-II thrombus), so we choose the clamp and go method as a short time procedure and avoided the need of veno-venous/cavo-atrial bypass. After clamping IVC both proximal and distal to the thrombus, it was opened and cleared thrombus from IVC and renal vein (Fig-3A, 3B). Then proper washing and closing of IVC with 4-0 prolene. Ensuring Hemostasis abdomen was closed in layers keeping drains in situ. The patient was discharged home on the 7th post-operative day with good health with advice to consult with oncologist. He is under follow-up and doing well for the last two years.

Discussion:

In case of renal cell carcinoma with IVC thrombi, prognosis is difficult to predict due to wide variety of clinical behavior.

Although involvement of IVC in renal cancer is generally not a vascular invasion by the neoplastic process but intraluminal extension of tumor mass.⁶ Prognostic significance of IVC thrombi in RCC patient is still controversial, 45-70% cases can be cured with surgery.^{2,7} Others showed 5 years' survival rates about 25-57% despite surgical resection of RCC and tumor thrombus.^{7,8} Mortality rate ranges from 2.7 to 13% for IVC extension of RCC.⁹

Skinner reported 5 years' survival rate after surgical treatment in 35% of subhepatic, 18% of intrahepatic and 0% for those with atrial tumor thrombi.¹⁰ Some authors found that in the absence of other adverse prognostic factor, the cephalad extension of IVC involvement is not prognostically important.¹¹ Cause of death were pulmonary embolism, myocardial infarction or complications related to bypass procedure.¹²

Others reported presence of local spread of tumor to the lymph nodes or perinephric tissue in RCC is a strong poor prognostic parameter but RCC extending only into the IVC have significantly better survival.^{12,13}

Although distant metastasis generally regarded as poor prognostic indicator, there was no significant difference in survival between patient with or without distant metastasis¹⁴ Hatcher noted prognosis depends on complete resection of mass, not by level of tumor thrombi.^{15,16}

In our case, it was level-II tumor thrombus (subhepatic), extension to renal capsule, regional lymphadenopathy and showed single hepatic metastasis. And the patient showed complication free survival for the last two years that match with the result of Skinner report.

Conclusion:

The patient of RCC with IVC tumor thrombi (even those with distant metastasis) should be considered for operation (as there was no other therapeutic modality). These tumors can be totally

resected by an aggressive approach with an acceptable morbidity and mortality and satisfactory long-term survival rate.

Conflict of Interest - None.

References:

01. Mootha RK, Butler R, Laucirica R, Scardino PT, Lerner SP. Renal cell carcinoma with an infrarenal vena caval tumor thrombus. *Urology*. 1999;54(3):561. doi:10.1016/s0090-4295(99)00136-3
02. Wszolek M, Wotkowicz C, Libertino J. Surgical management of large renal tumors. *Nature Clinical Practice Urology*. 2008;5(1):35-46. doi:10.1038/ncpuro0963
03. Hallscheidt PJ, Fink C, Haferkamp A, et al. Preoperative staging of renal cell carcinoma with inferior vena cava thrombus using multidetector CT and MRI: prospective study with histopathological correlation. *J Comput Assist Tomogr*. 2005;29(1):64-68. doi:10.1097/01.rct.0000146113.56194.6d
04. Rydberg JN, Sudakoff GS, Hellman RS, See WA. Positron emission tomography-computed tomography imaging characteristics of an inferior vena cava tumor thrombus with magnetic resonance imaging correlation. *J Comput Assist Tomogr*. 2004;28(4):517-519. doi:10.1097/00004728-200407000-00012
05. Jibiki M, Iwai T, Inoue Y, et al. Surgical strategy for treating renal cell carcinoma with thrombus extending into the inferior vena cava. *J Vasc Surg*. 2004;39(4):829-835. doi:10.1016/j.jvs.2003.12.004
06. Delis S, Dervenis C, Lytras D, Avgerinos C, Soloway M, Ciancio G. Liver transplantation techniques with preservation of the natural venovenous bypass: effect on surgical resection of renal cell carcinoma invading the inferior vena cava. *World J Surg*. 2004;28(6):614-619. doi:10.1007/s00268-004-7217-7
07. Zisman A, Wieder JA, Pantuck AJ, et al. Renal cell carcinoma with tumor thrombus extension: biology, role of nephrectomy and response to immunotherapy. *J Urol*. 2003;169(3):909-916. doi:10.1097/01.ju.0000045706.35470.1e
08. Kim HL, Zisman A, Han KR, Figlin RA, Beldegrun AS. Prognostic significance of venous thrombus in renal cell carcinoma. Are renal vein and inferior vena cava involvement different?. *J Urol*. 2004;171(2 Pt 1):588-591. doi:10.1097/01.ju.0000104672.37029.4b
09. Terakawa T, Miyake H, Takenaka A, Hara I, Fujisawa M. Clinical outcome of surgical management for patients with renal cell carcinoma involving the inferior vena cava. *Int J Urol*. 2007;14(9):781-784. doi:10.1111/j.1442-2042.2007.01749.x
10. Skinner DG, Pritchett TR, Lieskovsky G, Boyd SD, Stiles QR. Vena caval involvement by renal cell carcinoma. Surgical resection provides meaningful long-term survival. *Ann Surg*. 1989;210(3):387-394. doi:10.1097/0000658-198909000-00014
11. Persia A, Chkhotua A, Managadze L. Surgical management of renal cell carcinoma invading the inferior vena cava. *Georgian Med News*. 2006;136: 21-7.
12. Nesbitt JC, Soltero ER, Dinney CP, et al. Surgical management of renal cell carcinoma with inferior vena cava tumor thrombus. *Ann Thorac Surg*. 1997;63(6):1592-1600. doi:10.1016/s0003-4975(97)00329-9
13. Ramdave S, Thomas G, Berlangieri S et al. Clinical role of f-18 fluorodeoxyglucose positron emission tomography for detection and management of renal cell carcinoma. *Journal of Urology*. 2001;166(3):825-830. doi:10.1016/s0022-5347(05)65845-4
14. Parekh DJ, Cookson MS, Chapman W, et al. Renal cell carcinoma with renal vein and inferior vena caval involvement: clinicopathological features, surgical techniques and outcomes. *J Urol*. 2005;173(6):1897-1902. doi:10.1097/01.ju.0000158459.42658.95
15. Hatcher PA, Anderson EE, Paulson DF, Carson CC, Robertson JE. Surgical management and prognosis of renal cell carcinoma invading the vena cava. *J Urol*. 1991;145(1):20-24. doi:10.1016/s0022-5347(17)38235-6
16. Boorjian S, Sengupta S, Blute M. Renal cell carcinoma: vena caval involvement. *BJU Int*. 2007;99(5b):1239-1244. doi:10.1111/j.1464-410x.2007.06826.x