

Management of Renal mass with venous involvement

*Somendra Bansal¹, Laxmi Narayan Meena¹, Shalu Gupta¹,
Manav Suryavanshi²

¹SMS Medical college and attached hospitals Jaipur (Rajasthan), India

²Medanta- The Medicity, Gurgaon (Haryana), India

Address of Correspondance: *Laxmi Narayan Meena

I. Introduction

Involvement of venous system by tumor thrombus is one of unique feature of renal cell carcinoma (RCC). It occurs in 4% to 10 % of patients with RCC¹ and 10% to 25% of these patients presenting an extension above the hepatic vein up to the right atrium or even into the right ventricle ². Radical nephrectomy with inferior vena cava (IVC) thrombectomy remains most effective therapeutic option in patients with RCC and IVC thrombus. Approximately 45% to 70% of patients with RCC and IVC thrombus can be cured with this method¹. IVC involvement is more common on right side than left because of shorter renal vein. Accurate staging of tumor thrombus extension is essential for determining the appropriate surgical approach. Although extent of IVC thrombus can be identified by abdominal ultrasound and computed tomography (CT), MRI is the gold standard with sensitivity of 96% to 100%^{3,4}. The extension of tumor thrombus in the IVC can be classified into four levels (Table 1)¹.

Level	Extension
I	Adjacent to the ostium of renal vein
II	Extending up to the lower aspect of the liver
III	Involving the intrahepatic portion of the IVC but below the diaphragm
IV	Extending above the diaphragm

Table 1- Staging of the level of inferior vena cava (IVC) thrombus

Material And Methods

We retrospectively reviewed and analyzed the hospital records of 11 patients who underwent radical nephrectomy with IVC tumor thrombectomy for renal mass with venous involvement from July 2011 to May 2015 at Medanta Kidney and Urology Institute. Extension of tumor thrombus in the IVC was classified into four levels. Eleven patients underwent surgery. For one patient with right atrial thrombus extensions, sternotomy was done and cardiopulmonary bypass (CPB) with deep hypothermic circulatory arrest was used. The standard techniques were followed for mobilization & exposure, thrombectomy & repair. In all cases primary repair of IVC was done.

II. Results

During 4 years period, 11 patients underwent radical nephrectomy with IVC thrombectomy. Median age of patients was 52 years (range 10-70 years). Males to females ratio was 6:5 and right to left side ratio was 9:2. Of these 11 patients, 10 patients had symptoms and one patient was incidentally diagnosed on imaging. Level I, II, III and IV IVC thrombus were presented in 4, 5, 1 and 1 patients respectively. Mean duration of surgery was 265.6 minutes (range 150-420 minutes) and mean IVC clamp time was 10 minutes 39 seconds (range 6 min 15 sec -15 min). One patient underwent atrial thrombectomy along with IVC thrombectomy by CPB with deep hypothermic (22 degree) circulatory arrest. Cardiovascular surgery team was involved in this case, bypass time was 90 minutes and aortic cross clamp time was 57 minutes. Average blood loss during surgery was 1990 ml (300ml-4000ml). One patient had diaphragmatic injury during mobilization of liver for which chest tube was put and removed on postoperative day 4. Mean postoperative hospital stay was 7 days (5-13 days). There was no operative mortality. On histopathology report, 9 patients had clear cell carcinoma, one patient had wilm's tumor and another one patient had primary neuroectodermal tumor (PNET) or Ewing's sarcoma. Patient with wilm's tumor and PNET received chemotherapy.

Median follow up period was 24 months (2-48 months). One patient was lost to follow up and 2 patients expired during follow up, one patient at 6 months after surgery and another at 2 years after surgery and they developed metastatic disease. Of the rest 8 patients, 5 patients have no recurrence till now and 3 patients

developed nodal and distant metastatic disease and they were on sunitinib or pazopanib adjuvant targeted therapy.

III. Discussion

After developing incision, the duodenum is Kocherized and artery is targeted in interaortocaval groove and clipped or ligated in continuity in right side renal tumor. Care needs to be taken to avoid potential injury to left renal vein behind which the right renal artery lies. This maneuver helps to reduce blood loss during surgery and may help reduce size of arterialized thrombus and facilitate its eventually retrieval. Han Z et al.⁵ describe the modified liver mobilization technique which facilitates the effective exposure and proximal control of IVC for removing a level III thrombus. They divided the falciform ligament to expose the entire suprahepatic IVC, without having to incise the right superior coronary ligament and left triangular ligament.

In this study, male to female ratio was 6:5 and Level I,II,III and IV IVC thrombus were presented in 4,5,1 and 1 patients respectively. In the study of Helfand et al⁶, male to female ratio was 13:9 and Level I,II,III and IV IVC thrombus were 50% (n = 11), 32% (n = 7), 9% (n = 2) and 9% (n = 2) respectively.

Mean operative time was lower (265.6 minutes versus 547.9 ± 138.5 minutes) and mean IVC cross-clamp time was similar (10 minutes 39 seconds versus 10.8 minute) compared to Helfand et al⁶. They found that for advanced RCC with tumor thrombus extension into the IVC, lateral venorrhaphy and primary IVC repair avoids complicated caval reconstructions and results in high patency rates with a low local tumor recurrence rate. Estimated blood loss was 1.6 liter in right side and 2 liters in left side radical nephrectomy and IVC thrombectomy in Katkooori D et al⁷ series, which was comparable to our study (1.9 liters). Postoperative bleeding and coagulation disturbances were the most frequently reported complications in patients who underwent IVC thrombectomy with nephrectomy Ayati et al⁸. reported on the outcome of 11 patients who had RCC with IVC tumor thrombosis. Four patients were tumor free (follow-up range 9 to 18 months) and 7 expired due to multiple metastases during the follow up. In our study, during 2-48 months of follow up, 5 patients have no recurrence till now and 5 patients have nodal and distant metastatic disease out of them 2 patients expired. They concluded that extensive surgical treatment was the best means of treating these patients.

Kwon et al⁹ studied 35 patients who underwent IVC tumor thrombectomy with radical nephrectomy. The overall 5-yr survival rate was 50.6% and median survival was 54 months. Seventeen patients presented with tumor recurrence during follow up, most common site of recurrence was lungs (58.8%). During the follow-up period, 11 (31.4%) patients died. Prognosis of RCC with IVC thrombus^{10,11} is determined by the ability to perform a complete resection of the tumor, not by the level of tumor thrombus^{10,11}. According to Kwon et al⁹, the role of liver mobilization, hepatic vascular exclusion, and cardiopulmonary bypass, can be determined by the level of tumour thrombus and complete thrombus removal without tumor fragmentation under long venotomy on fully exposed involved IVC is recommended for successful result in a bloodless operative field.

In the large series of Kulkarni et al.¹², 100 patients underwent IVC thrombectomy and out of them, five patients were lost to follow up. At 5 year follow up, overall survival was 63%, of those 55% patients were alive without disease (disease free survival) and 08% were alive with metastasis. Further 2 patients expired in immediate postoperative period while 30 had expired in follow up due to metastasis. Radical surgical resection remains mandatory in locally advanced RCC. The role of adjuvant and neoadjuvant therapy in these patients remains unknown until the data from ongoing trials become available¹³. Limitation of our study was its retrospective nature, limited number of patients and short duration of follow up.

IV. Conclusion

Retrospective analysis of our data over 4 years shows surgical therapy till date remains the optimal treatment for locally advanced renal mass with IVC thrombus with reasonably good results.

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