Cytoreductive Nephrectomy with Concomitant IVC Tumor Thrombectomy in Metastatic Renal Cell Carcinoma

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Introduction

- RCC exhibits a unique vascular tropism enabling tumor thrombus extension into the inferior vena cava (IVC), occurring in 4% - 10% of all presenting cases.
- Nephrectomy with tumor thrombectomy remains the mainstay treatment in this setting, a complex procedure necessitating multidisciplinary expertise.
- Delay of surgery raises risk of thrombus progression including tumor embolism, Budd-Chiari syndrome, and progression to the right atrium.
- Role and timing of CN for patients with metastatic RCC (mRCC) remains a moving target, given paramount role of systemic therapy.
- Patients with IVC tumor thrombus (IVCTT) in the setting of mRCC pose an even greater challenge, as effectively treating the IVCTT while avoiding progression of metastases must be counterbalanced.

Objective

We sought to characterize perioperative and survival outcomes in patients with mRCC undergoing CN in presence of IVCTT.

Methods

- We reviewed our institutional registry of patients who underwent nephrectomy between 1996 and 2021.
- Patients undergoing CN were stratified by IVCTT.
- Presence and extent of tumor thrombus was graded according to the Mayo Clinic Grading System.
- Perioperative outcomes, including estimated blood loss (EBL), hospital length of stay (LOS), intraoperative or postoperative complications, and 90-day readmission rates were assessed.
- Postoperative complications were graded according to the Clavien-Dindo classification.
- Appropriate statistical tests were conducted using Stata 17.0.

Results

Table 1: Baseline clinicopathologic characteristics of patients that underwent CN stratified by IVCTT presence.

Factor	Value	Without IVCTT (126)	With IVCTT (26)	P-value
CCI, median (IQR)		8 (7, 8)	9 (8, 11)	**<0.001**
Laterality	Left	71 (56.3%)	6 (23.1%)	**0.002**
	Right	55 (43.7%)	20 (76.9%)	
Pathological Tumor Size, median cm (IQR)		8.5 (6.0, 10.4)	11.5 (8.0, 15.0)	**<0.001**
Tumor Grade	2	21 (16.7%)	1 (3.8%)	0.083
	3	58 (46.0%)	10 (38.5%)	
	4	43 (34.1%)	14 (53.8%)	
	Unknown	4 (3.2%)	1 (3.8%)	
Pathological Stage Classification	pT1	13 (10.3%)	0 (0.0%)	**0.005**
	pT2	21 (16.7%)	0 (0.0%)	
	pT3	82 (65.1%)	26 (100.0%)	
	pT4	10 (7.9%)	0 (0.0%)	
Lymphovascular Invasion	No	79 (62.7%)	7 (26.9%)	**0.002**
	Yes	42 (33.3%)	16 (61.5%)	
	Unknown	5 (4.0%)	3 (11.5%)	
Sarcomatoid Features	No	115 (91.3%)	15 (57.7%)	**<0.001**
	Yes	11 (8.7%)	8 (30.8%)	
	Unknown	0 (0.0%)	3 (11.5%)	
Rhabdoid Features	No	38 (30.2%)	14 (53.8%)	**0.035**
	Yes	13 (10.3%)	0 (0.0%)	
	Unknown	75 (59.5%)	12 (46.2%)	
Systemic Therapy Received	No	39 (31.0%)	8 (30.8%)	0.97
	Yes	86 (68.3%)	18 (69.2%)	
	Unknown	1 (0.8%)	0 (0.0%)	
Timing of Systemic Therapy	Pre-CN	4 (5.0%)	1 (6.0%)	0.83
	Post-CN	82 (94.0%)	16 (89.0%)	
	Unknown	1 (1.0%)	1 (6.0%)	
Metastatic Sites	1	57 (45.2%)	12 (46.2%)	0.25
	2	44 (34.9%)	10 (38.5%)	
	3	21 (16.7%)	1 (3.8%)	
	4	1 (0.8%)	1 (3.8%)	
	Unknown	3 (2.4%)	2 (7.7%)	

Table 2: Perioperative and postoperative outcomes following CN stratified by IVCTT presence.

Factor	Level	Without IVCTT (126)	With IVCTT (26)	P-value
Perioperative Outcomes				
Approach	Minimally Invasive	87 (69.0%)	0 (0.0%)	**<0.001**
	Open	39 (31.0%)	26 (100.0%)	
EBL (mL), median (IQR)		250 (100,999)	1000 (999, 2500)	**<0.001**
Intraoperative Complication	No	117 (92.9%)	20 (76.9%)	0.085
	Yes	5 (4.0%)	3 (11.5%)	
	Unknown	4 (3.2%)	3 (11.5%)	
Median LOS, days (IQR)		3 (2, 6)	5.5 (4, 7)	**0.022**
Postoperative Outcomes				
Postoperative Complication	No	105 (83.3%)	21 (80.8%)	0.75
	Yes	21 (16.7%)	5 (19.2%)	
Clavien-Dindo Classification	Grade I	6 (29%)	2 (40%)	0.28
	Grade II	7 (33%)	1 (20%)	
	Grade IIIa	4 (19%)	0 (0%)	
	Grade IIIb	1 (5%)	0 (0%)	
	Grade IVa	2 (10%	0 (0%)	
	Grade IVb	0 (0%)	1 (20%)	
	Grade V	1 (5%)	1 (20%)	
90-day Readmission	No	110 (87.3%)	23 (88.5%)	0.97
	Yes	5 (4.0%)	1 (3.8%)	
	Unknown	11 (8.7%)	2 (7.7%)	

Figure 1: Overall survival of patients after CN stratified by IVCTT presence.

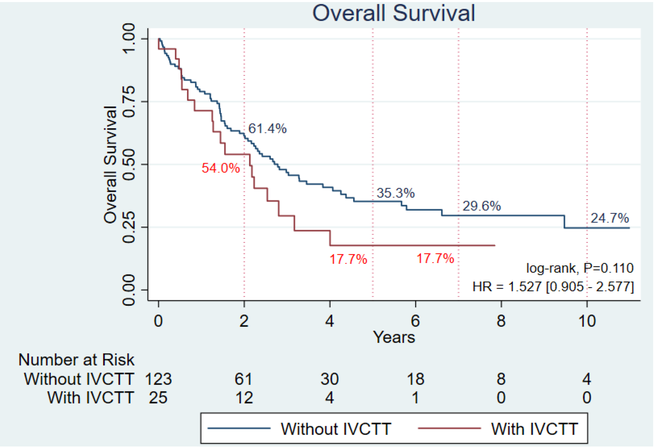

Table 3: Multivariable Cox regression analysis for worse OS after CN.

Factor	Level	HR	95% CI	P-Value
IVCTT	No IVCTT		Reference	
	IVCTT	1.368	0.140 – 13.414	0.788
CCI		1.057	0.881 – 1.269	0.549
Path. Stage Classification	pT1		Reference	
	pT2	3.665	0.984 – 13.647	0.053
	pT3	1.472	0.402 – 5.389	0.559
	pT4	2.296	0.312 – 16.863	0.414
Laterality	Left		Reference	
	Right	0.807	0.455 – 1.432	0.464
Presence and Extent of Tumor Thrombus	None		Reference	
	Level 0	0.970	0.468 – 2.013	0.935
	Level I-III	0.991	0.121 – 8.129	0.993
	Level IV	1.911	0.091 – 40.070	0.677
Sarcomatoid Features	No		Reference	
	Yes	1.287	0.545 – 3.038	0.565
Timing of Systemic Therapy	Pre-op		Reference	
	Post-op	1.368	0.294 – 6.378	0.690
Metastatic Sites	1		Reference	
	2	0.993	0.526 – 1.875	0.983
	3	1.240	0.536 – 2.869	0.616
	4	1.594	0.316 – 8.036	0.572

Conclusions

- No observed increased complication rates or worse OS in patients undergoing CN in the presence of IVCTT compared to those without IVCTT.

<u>Take Away</u>: Patient selection and the timing of surgery with respect to systemic therapy administration must be carefully weighed in a multidisciplinary fashion at high-volume, experienced centers in order to effectively treat the IVCTT while avoiding progression of metastases.