

Decision making and strategies in inferior vena cava transection during robotic venous thrombectomy: a feasibility study based on venography

Songliang Du^{1,2}, Dan Shen¹, Qingbo Huang¹, Cheng Peng¹, Xu Zhang¹, Xin Ma¹

¹Department of Urology, Chinese PLA General Hospital, Beijing, China. ²School of Medicine, Nankai University, Tianjin, China.

Introduction and Objective

Introduction

- Resection and complex reconstruction of the inferior vena cava (IVC) beyond a standard cavourrhaphy are highly demanding during tumor thrombectomy for locally advanced renal cell carcinoma.
- IVC resection is indicated by tumour infiltration into the IVC wall, dense adherence of the tumour thrombus to the endothelium, complete obliteration of the IVC lumen, and the presence of bland thrombus in distal IVC to achieve local cancer control and prevention of pulmonary embolism.
- There is considerable controversy about the necessity of reconstructing the IVC after tumor resection

Objective

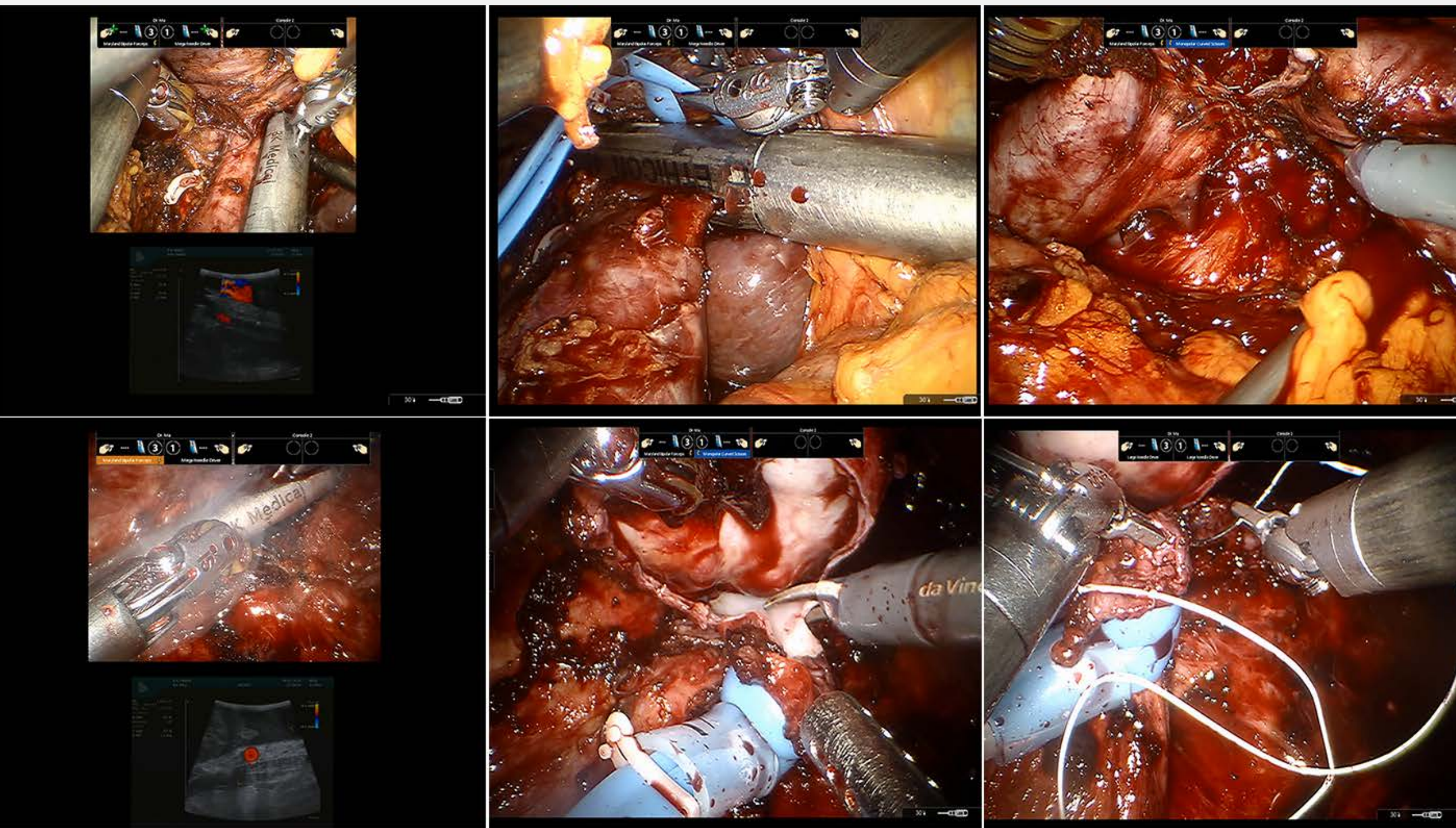
- To describe the indications, techniques, complications and outcomes of inferior vena cava (IVC) transection without reconstruction during robotic venous tumor thrombectomy.
- To introduce the application of IVC venography in the preoperative surgical decision making and postoperative evaluation.

Methods

- Nine patients with venous thrombus underwent IVC transection from July 2016 to September 2017. Primary tumor type was renal cell carcinoma in 8 patients and retroperitoneal Malignant solitary fibrous tumor in 1. Venography was performed both preoperatively and postoperatively. Indications for IVC transection include complete IVC occlusion, venous wall invasion, dense adherence of the tumor to the endothelium, the presence of bland thrombus in distal IVC and establishment of potent collateral circulation.

Methods

Characteristic	Result
No. patients	9
Median age, yr (Range)	59.5 (40-67)
Male/female (n)	4/4
Median BMI, kg/m ² (Range)	26.1 (23.4-28.1)
No. Left/Right	1/8
Median tumor size, cm (Range)	7.8 (6.0-10.0)
Clinical stage, n (%)	
T3bN0M0	7 (77.8)
T3bN1M0	1 (11.1)
T3bN0M1	1 (11.1)
IVC thrombus classification, n (%)	
II	8 (88.9)
III	1 (11.1)
Median IVC thrombus length, cm (Range)	7.7 (6.0-13.5)
Presence of bland thrombus in distal IVC, n (%)	5 (55.6)



Surgical Technique

- Intraoperative ultrasound was used to identify the thrombus limit and major collateral vessels. For right cases with Mayo level I-II thrombus, the caudal IVC, left renal vein, and cephalic IVC was ligated and transected with Endo-GIA. The tumor and IVC, which included the thrombus, were en bloc resected.

Methods

Surgical Technique

- In cases of Mayo level III-IV thrombus, the IVC was ligated and transected below the second porta hepatis; the IVC above the second porta hepatis was cut and then sutured after removal of the thrombus. For left cases, the IVC was ligated and transected at infra-renal vein level; the IVC above the right renal vein was cut and reconstructed after removal of the thrombus.

Results

Variable	Results
Median operative time, min (Range)	290 (243-470)
Median estimated blood loss, ml (Range)	1700 (1200-6000)
Patients receiving transfusion, n (%)	9 (100)
Median blood transfusion, ml (Range)	1000 (580-3880)
Median intensive care unit stay, d (Range)	4 (3-6)
Median time to full ambulation, d (Range)	5 (2-7)
Median postoperative hospital stay, d (Range)	8.5 (5-30)
Positive surgical margin, n (%)	0 (0)
Histology, n (%)	
RCC	6*
Sarcoma	2
Malignant solitary fibrous tumor	1

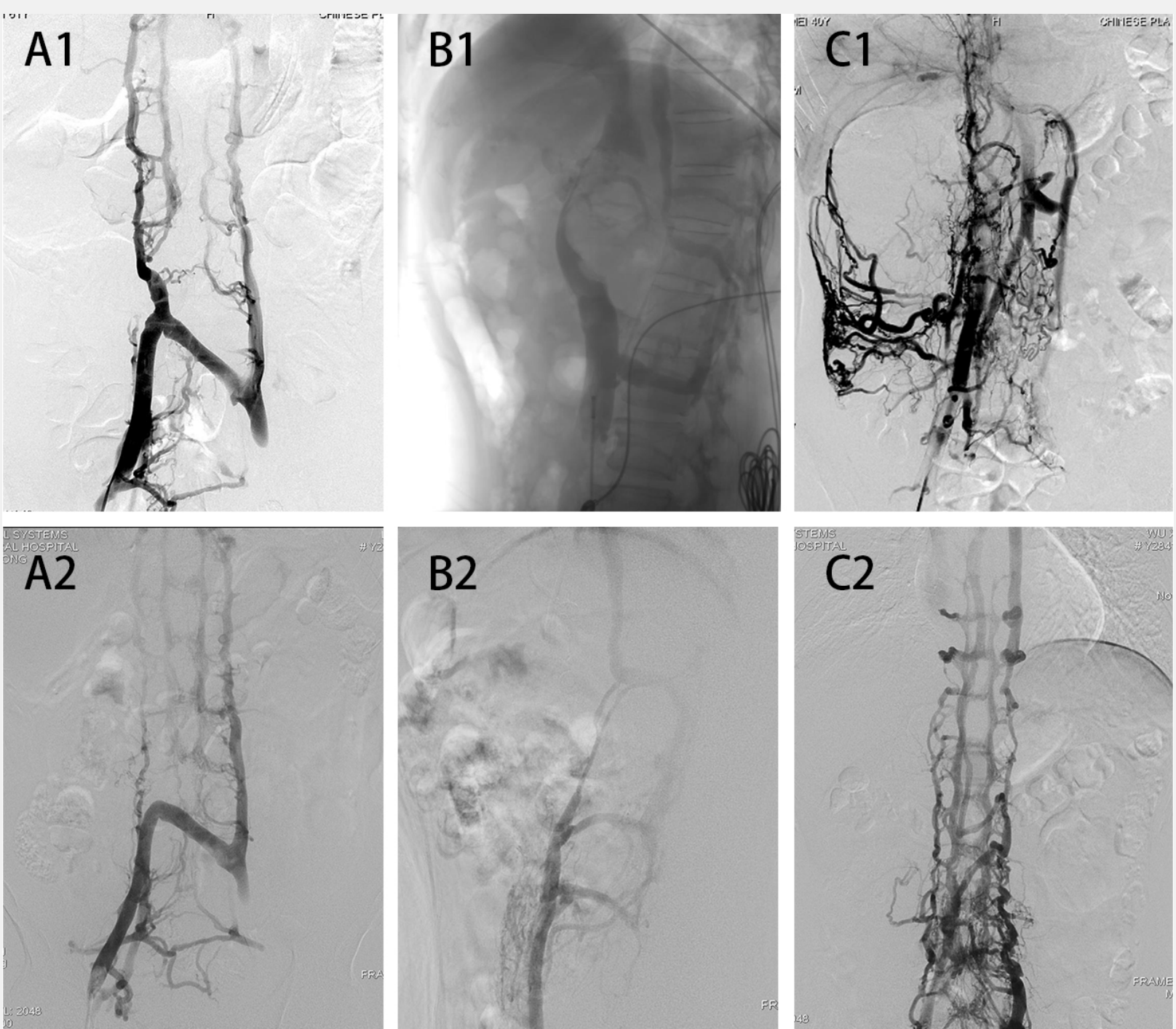
- All patients were routinely transferred to intensive care unit after surgery to monitor the heart, renal and hemodynamic function. Median intensive care unit stay was 4d (3-6). All patients were discharged uneventfully except for four cases (33.3%) with mild lower extremity edema, which recuperated within 1 mo during the follow up. Median preoperative serum creatinine was 94.9 μ mol/L (58.7-174.5). Median serum creatinine at 1 to 3-month follow up was 102.7 μ mol/L (62.5-162.3). Complications of Grade I-d and Grade II occurred in 4 and 3 cases, respectively.

Results

Follow-up

- Median Follow-up: 5 months (Range: 2-12)
- Postoperative venography was performed at 2-4 months follow-up
- New-onset metastasis occurred in 3 patients postoperatively, resulting in 2 deaths. One died from hepatic metastasis 5.5 months after surgery and the other died from multiple organ metastasis.

IVC venography



A1: preoperative venography of case 1; A2: venography two months after surgery of case 1.
B1: preoperative venography of case 2; B2: venography three months after surgery of case 2.
C1: preoperative venography of case 3; C2: venography three months after surgery of case 3.

Conclusions

- IVC transection is safe and feasible during robotic venous thrombectomy. Venography is essential to identify the collateral vessels and help in preoperative decision making. According to tumor thrombus extent, primary tumor side, vena cava obstruction, venous wall invasion, establishment of collateral circulation, different strategies could be developed preoperatively.