

Malignant Inferior Vena Cava Syndrome and Congestive Hepatic Failure Treated by Venous Stent Placement

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ABSTRACT

A 65-year-old woman with liver metastases from colon cancer and tumor thrombus extending from the right hepatic vein (HV) to the right atrium (RA) presented with marked lower-extremity edema and massive ascites. Computed tomography showed tumor thrombus completely occluding the inferior vena cava (IVC) and HV ostia. Recanalization of the IVC and HVs was performed. Metallic stents were placed in tandem from the superior vena cava to the IVC through the RA, and additional metallic stents were placed in the left HV. The patient's symptoms were relieved, and there was no recurrence of these symptoms for 19.5 months until death.

ABBREVIATIONS

HV = hepatic vein, IVC = inferior vena cava, LHV = left hepatic vein, RA = right atrium, RHV = right hepatic vein, SVC = superior vena cava

Malignant obstruction of the inferior vena cava (IVC) can lead to IVC syndrome, ascites, and marked lower-extremity and truncal edema (1). If the level of obstruction is cephalad of the hepatic veins (HVs), liver function deteriorates, and there is marked ascites (2). These symptoms may improve with the development of collateral circulation, but the improvement is partial in most cases (3). Venous stent placement has been reported to be an effective palliative procedure for IVC obstruction (1–7). This report describes venous stent placement in a case of IVC syndrome and congestive hepatic failure caused by tumor thrombus completely occluding the IVC.

CASE REPORT

Our institutional review board requires no approval for publication of retrospective case reports such as this.

A 65-year-old woman was referred to our hospital for initial treatment of sigmoid colon cancer with multiple liver metastases. Computed tomography (CT) revealed tumor thrombus extending from the right HV (RHV) to the IVC. She had received hepatic arterial infusion chemotherapy for multiple liver metastases and then underwent sigmoidectomy. CT imaging 3 months after surgery showed that the liver metastases and tumor thrombus were smaller. However, 5 months after surgery, the patient presented with a sudden onset of marked lower-extremity edema and massive ascites. CT imaging showed acute thrombus formation in the left HV (LHV) and middle HV caused by tumor thrombus regrowth completely occluding the IVC and HV ostia, as well as tumor thrombus extending to the right atrium (RA; **Fig 1**). The laboratory findings showed borderline hepatic failure (**Table**). Bearing in mind her bleeding tendency in the setting of hepatic failure, immediate thrombolytic and anticoagulant therapy was undertaken with low-dose urokinase (240,000 IU/d) and heparin (10,000 IU/d) for 4 days, but this did not result in improvement in liver function, and the patient's Eastern Cooperative Oncology Group performance status worsened from grade 2 to grade 3. After written informed consent was

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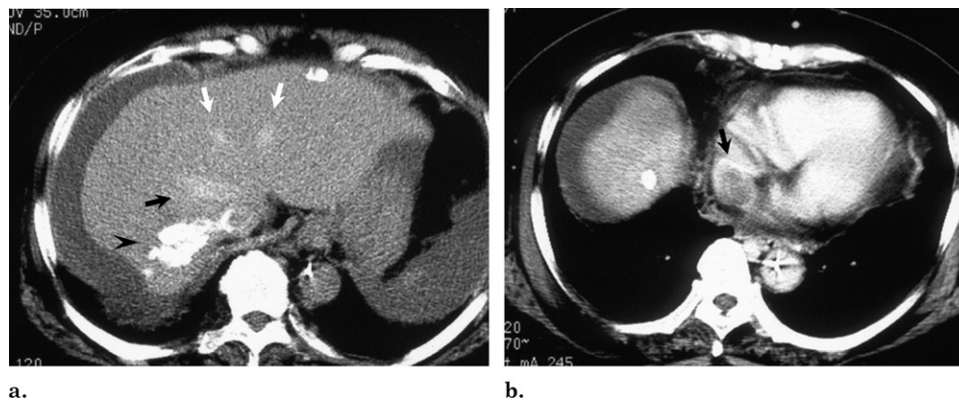


Figure 1. (a) Unenhanced CT image reveals high density because of acute thrombus formation in LHV (white arrows) and middle HV (black arrow). Calcification of liver metastases in the RHV are indicated by the arrowhead. (b) Enhanced CT image shows tumor thrombus extending from the RHV to the RA (arrow).

Table. Laboratory Data

Parameter	Preprocedure			Postprocedure	
	27 d	4d	1 d	6 d	18 d
AST (U/L)	19	245	815	32	23
ALT (U/L)	12	139	347	39	17
ALP (U/L)	338	415	506	287	378
T-bil (mg/dL)	1.3	5.4	6.2	3.4	1.9
INR	1.22	2.20	2.33	1.53	1.29

ALP = alkaline phosphatase, ALT = alanine aminotransferase, AST = aspartate aminotransferase, INR = International Normalized Ratio, T-bil = total bilirubin.

obtained, recanalization of the IVC and HVs via an endovascular approach was attempted.

Venography performed via the right common femoral vein access revealed complete obstruction of the hepatic segment of the IVC (**Fig 2a**). Metallic stent placement from the superior vena cava (SVC) to the IVC through the RA was planned to prevent stent migration into the RA. However, the stent delivery sheath (14-F Z-stent, vena caval and venous design with radiopaque band introducer set; William Cook Europe, Bjaeverskov, Denmark) could not be passed as a result of tight IVC occlusion. A 0.035-inch Radifocus M guide wire (Terumo, Tokyo, Japan) was inserted from the right femoral vein and snared from a transjugular venous access route. Therefore, the 14-F stent delivery system was introduced via the femoral vein with a transjugular pull-through approach. Four metallic stents (two 80 mm long and 20 mm in diameter and two 80 mm long and 18 mm in diameter; Spiral Z-stent; Cook, Bloomington, Indiana) were placed from the SVC to the IVC in tandem, overlapping each other.

Then, metallic stent placement in the HVs was attempted. Venography of the LHV by a retrograde injection via the recanalized IVC through the Z-stent interstices revealed thrombus formation caused by tumor occluding the HV ostia. A guide wire inserted from a transjugular

approach could not penetrate the stent struts, and an ultrasound (US)-guided approach was unsuccessful as a result of poor image quality. Under fluoroscopic guidance, puncture of the LHV with a thrombus, which had retained contrast media, was performed percutaneously (**Fig 2b, 2c**). After guide wire insertion via transhepatic approach to the RA, balloon angioplasty of the vena cava stents was performed (balloon 80 mm long and 20 mm in diameter). Eventually, three metallic stents (tandem stents 80 mm long and 10 mm in diameter and 60 mm long and 10 mm in diameter [LUMINEXX; C. R. Bard, Covington, Georgia] and another stent 80 mm long and 10 mm in diameter [S.M.A.R.T.; Cordis, Bridgewater, New Jersey]) were placed in the LHV side by side with the IVC stents (**Fig 2d**). Venography via the femoral vein and the LHV showed good blood flow (**Fig 2e, 2f**). Postoperative thrombolytic and anticoagulant therapy including low-dose urokinase (240,000 IU/d) and heparin (10,000 IU/d) was administered intravenously for 4 days, and then aspirin therapy was continued. The patient's symptoms were almost relieved by 4 days after treatment, and liver function had improved at 18 days after stent placement (**Table**). The patient subsequently underwent radiation therapy for the tumor thrombus in the IVC and RA. US examination 3 and 18 days after the procedure demonstrated LHV and IVC stent patency.

After radiation therapy, the patient again underwent hepatic arterial infusion chemotherapy and systemic chemotherapy. Follow-up enhanced CT demonstrated vena cava stent patency (**Fig 3**). There was no recurrence of IVC syndrome and congestive hepatic failure until the patient's death as a result of underlying disease 19.5 months after the procedure.

DISCUSSION

Malignant caval obstruction is traditionally treated with radiation therapy and, in selected patients, chemotherapy or surgery (4,8). However, symptomatic relief is often delayed, and the initial edema induced by radiation therapy

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