Endovascular Placement of Iodine-125 Seed Strand and Stent Combined with Chemoembolization for Treatment of Hepatocellular Carcinoma with Tumor Thrombus in Main Portal Vein

JianJun Luo, MD, ZhiPing Yan, MD, QinXin Liu, MD, XuDong Qu, MD, and JianHua Wang, MD

ABSTRACT

Purpose: To study the safety and feasibility of endovascular placement of an iodine-125 (^{125}I) seed strand and stent combined with chemoembolization to treat hepatocellular carcinoma (HCC) with tumor thrombus in the main portal vein (MPV).

Materials and Methods: From February 2008 to October 2009, 32 patients with HCC complicated by tumor thrombus in MPV were enrolled into this study (28 men and 4 women, mean age 53.2 years ± 8.8). After ^{125}I seed strand and self-expandable stent had been placed in the obstructed MPV, chemoembolization was performed. All patients were followed up every 30 days. Patency of stent and response of HCC were evaluated by abdominal contrast-enhanced computed tomography (CT) scan.

Results: The technical success rate was 100% for placement of the ^{125}I seed strand and stent in the obstructed MPV. No serious procedure-related complications occurred. During a mean follow-up of 217.5 days ± 151.6, the objective response rate of HCC to chemoembolization was 37.5%. The 90-day, 180-day, and 360-day cumulative survival rates were 96.4%, 67.4%, and 39.3%, and the cumulative stent patency rates were 96.7%, 83.4%, and 83.4%.

Conclusions: Endovascular placement of ^{125}I seed strand and stent combined with chemoembolization was safe and feasible to treat HCC with tumor thrombus in the MPV.

ABBREVIATIONS

CI = confidence interval, CR = complete response, HCC = hepatocellular carcinoma, ^{125}I = iodine-125, MPV = main portal vein, PD = progressive disease, PR = partial response, SD = stable disease, SPECT = single photon emission computed tomography, 3-DCRT = three-dimensional conformal radiotherapy

Hepatocellular carcinoma (HCC) is the sixth most common cancer worldwide (1). Portal venous invasion is reported in 12.5%–39.7% of patients with advanced HCC (2). When the main portal vein (MPV) was involved by tumor thrombus, the patient's prognosis was extremely poor. Without treatment, median survival time of these patients is only 2.7–4 months (2–4).

Tumor thrombus in the MPV reduces portal blood supply to hepatic parenchyma and aggravates portal hypertension in patients with cirrhosis. The hepatic reserve of these patients is often seriously reduced, and the complications of portal hypertension, such as gastroesophageal variceal bleeding and ascites, occur more frequently (2). This limits therapeutic options in these patients (1–4).

Radiotherapy, intra–portal vein stent placement, chemoembolization, and radioembolization have been used to treat HCC with MPV tumor thrombus (2,5–13). Three-dimensional conformal radiotherapy (3-DCRT) can provide local control of tumor thrombus in portal vein without worsening the liver function of patients with HCC (5,6). Recently, combined therapies, such as chemoembolization with intra–portal vein stent placement (7,10) and chemoembolization with 3-DCRT (5), have been used for treating HCC with MPV invasion. However, the ability of chemoembolization to inhibit the growth of tumor thrombus in MPV is controversial. Without stent placement, neither chemoembolization nor

From the Department of Radiology, Zhongshan Hospital, Fudan University, No. 180 Fenglin Road, Shanghai, CN 200032, China. Received January 25, 2010; final revision received November 15, 2010; accepted November 23, 2010. **Address correspondence to** J.J.L.; E-mail: 13801924777@163.com

None of the authors have identified a conflict of interest.

J Vasc Interv Radiol 2011; 22:479–489

DOI: 10.1016/j.jvir.2010.11.029

Table 1. Patient Characteristics

	HCC			
Case No./Sex/Age	**Morphology**	**Location**	**Size (mm)***	**Location of Tumor Thrombus**
1/M/55	Diffuse	Bilobe	82	RIPVB + MPV
2/M/53	Diffuse	Right lobe	93	RIPVB + MPV
3/M/62	Diffuse	Right lobe	63	RIPVB + MPV
4/F/48	Diffuse	Bilobe	87	RIPVB + MPV
5/M/58	Diffuse	Right lobe	85	RIPVB + MPV
6/M/47	Diffuse	Left lobe	94	LIPVB + MPV
7/M/59	MH + DN	Left lobe	68	LIPVB + MPV
8/M/57	Multifocal	Bilobe	63	LIPVB + MPV
9/M/67	Multifocal	Bilobe	65	RIPVB + MPV
10/M/50	Diffuse	Right lobe	57	RIPVB + MPV
11/F/60	MH + DN	Left lobe	58	LIPVB + MPV
12/F/30	Mutifocal	Bilobe	95	RIPVB + MPV
13/M/49	Diffuse	Left lobe	84	LIPVB + MPV
14/M/55	Diffuse	Right lobe	94	RIPVB + MPV
15/M/47	Diffuse	Left lobe	89	LIPVB + MPV
16/M/39	MH + DN	Bilobe	71	RIPVB + MPV
17/M/43	Diffuse	Left lobe	89	LIPVB + MPV
18/M/69	MH + DN	Bilobe	53	RIPVB + MPV
19/M/48	Diffuse	Right lobe	88	RIPVB + MPV
20/M/76	Diffuse	Left lobe	67	LIPVB + MPV
21/M/54	Diffuse	Right lobe	87	RIPVB + MPV
22/F/53	MH + DN	Right lobe	69	RIPVB + MPV
23/M/42	Diffuse	Right lobe	93	RIPVB + MPV
24/M/56	Mutifocal	Bilobe	79	RIPVB + MPV
25/M/58	Diffuse	Right lobe	112	RIPVB + MPV
26/M/53	MH + DN	Right lobe	56	RIPVB + MPV
27/M/46	Mutifocal	Bilobe	78	LIPVB + MPV
28/M/55	MH + DN	Bilobe	135	RIPVB + MPV
29/M/48	Multifocal	Right lobe	175	RIPVB + MPV
30/M/56	MH + DN	Right lobe	156	RIPVB + MPV
31/M/53	Mutifocal	Bilobe	132	RIPVB + MPV
32/M/57	Mutifocal	Right lobe	85	RIPVB + MPV

HCC = hepatocellular carcinoma, LIPVB = left intrahepatic portal vein branches, MH + DN = massive hepatocellular carcinoma with daughter nodules, MPV = main portal vein, RIPVB = right intrahepatic portal vein branches, VB = variceal bleeding.
* HCC size = mean diameter of all intrahepatic measurable tumor lesions.

3-DCRT can promptly restore the flow in the obstructed MPV or effectively reduce the high portal pressure caused by tumor thrombus.

Brachytherapy with interstitial implantation of iodine-125 (^{125}I) seeds has been used to treat HCC with promising results (14–16). To our knowledge, no data of brachytherapy combined with intra–portal vein stent placement for treating malignant MPV obstruction have been reported so far. The purpose of this article is to report our preliminary results after endovascular placement of a ^{125}I seed strand and stent combined with chemoembolization to treat HCC with tumor thrombus in the MPV.

MATERIALS AND METHODS

Inclusion and Exclusion Criteria

This prospective study was approved by the ethical committee and institutional review board of our hospital. Beginning in February 2008, patients admitted to our hospital with HCC complicated by tumor thrombus in the MPV were considered for study enrollment. The inclusion criteria were as follows: *(i)* diagnosis of HCC confirmed by histology, cytology, or persistently elevated serum alpha-fetoprotein (> 400 ng/mL) with typical imaging findings; *(ii)* the unsuitability of HCC for resection according to the Barcelona Clinical Liver Cancer staging classification (17),