Arterial Portography during Transarterial Chemoembolization: Still a Necessity in the Age of Contrast-enhanced Cross-sectional Imaging?

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ABSTRACT

Purpose: To evaluate the necessity of arterial portography (AP) if a patent portal vein is seen on imaging before transarterial chemoembolization.

Materials and Methods: All patients who underwent transarterial chemoembolization between January 2004 and July 2011 were retrospectively recruited. The study included 131 patients (100 men, 31 women) undergoing 243 transarterial chemoembolization procedures. AP was performed during 93 procedures. The mean time interval between imaging performed before transarterial chemoembolization and the transarterial chemoembolization procedure was 46.5 days (range, 0–161 d).

Results: AP did not detect any new cases of portal vein thrombosis (PVT) when imaging performed transarterial chemoembolization showed a patent portal vein. Imaging performed after transarterial chemoembolization revealed one main PVT, one left PVT extending into the main portal vein, two left PVT, and one right PVT. When imaging performed before transarterial chemoembolization showed a patent portal vein and AP was omitted, imaging performed after transarterial chemoembolization showed one case of main PVT, two right PVT, and two left PVT. In both groups, there was no significant difference in mortality ($P = .673$) or morbidity ($P = .581$) related to transarterial chemoembolization.

Conclusions: AP is unnecessary if transarterial chemoembolization is performed within a reasonable time frame following computed tomography or magnetic resonance imaging that showed a patent portal vein. Omitting AP potentially reduces contrast material and radiation burden to both the patient and the operator.

ABBREVIATIONS

AP = arterial portography, HCC = hepatocellular carcinoma, PVT = portal vein thrombosis

Transarterial chemoembolization is the standard of care for patients with intermediate-stage hepatocellular carcinoma (HCC) (1,2). The preferential delivery of chemotherapy to liver tumors is based on several anatomic and pathologic factors that are unique to hepatic solid tumors. The liver parenchyma receives most of its blood supply from the portal vein, whereas HCCs are almost exclusively supplied by the hepatic artery. Selective arterial occlusion results in ischemic tumor necrosis, while the portal vein maintains blood supply, minimizing damage to the rest of the liver. Because of the possibility of liver failure after embolization, transarterial chemoembolization is contraindicated or selective technique is required in patients with HCC with main portal vein thrombosis (PVT) (3–6).

Arterial portography (AP) is often performed to document a patent portal vein before arterial embolization (7). AP is performed by a bolus transcatheter injection of contrast material into the celiac axis or superior mesenteric artery followed by prolonged fluoroscopic exposure to image the portal vein following venous return from the splenic vein or mesenteric veins, respectively. However, the patency of the portal vein is routinely studied during contrast-enhanced computed tomography (CT) or magnetic resonance (MR) imaging performed before transarterial chemoembolization for the diagnosis and staging of HCC. A methodical review of the continuing necessity for AP as part of transarterial chemoembolization in the age of contrast-enhanced cross-sectional imaging is

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needed. The primary aim of the present study is to evaluate whether performing AP is still necessary if a patent portal vein is seen on CT or MR imaging performed before transarterial chemoembolization.

MATERIALS AND METHODS

Patients and Tumor Characteristics

A waiver of institutional review board was obtained. A retrospective review of all patients who underwent transarterial chemoembolization for HCC between January 1, 2004, and July 31, 2011, was performed. Patients were identified from our picture archiving and communication system and electronic medical records. CT and MR images obtained before transarterial chemoembolization, images obtained during transarterial chemoembolization, and initial follow-up CT and MR images obtained after transarterial chemoembolization were reviewed. Patients with incomplete records were excluded.

Within the study period, 276 transarterial chemoembolization procedures were performed in 151 consecutive patients (34 women and 117 men) with HCC. There were 33 procedures excluded because of lack of imaging before transarterial chemoembolization (n = 2), lack of imaging after transarterial chemoembolization (n = 30), and incomplete data (n = 1). The demographics of the study population are summarized in Table 1. Our study population consisted of 131 patients (31 women and 100 men) ranging in age from 41–87 years (mean age, 66.1 y). In the study population, 243 transarterial chemoembolization procedures were performed (mean number of transarterial chemoembolization procedures per patient, 1.84; range, 1–7). All transarterial chemoembolization procedures were performed technically successfully, and AP was performed on 93 occasions.

Table 1. Patient Demographics

Characteristics	Value	%
Age (y)		
Mean	66.1	
Range	41–87	
Sex		
Male	100	76.3
Female	31	23.7
Etiology		
Hepatitis B	60	45.8
Hepatitis C	12	9.2
Hepatitis B and C	3	2.3
Alcoholic cirrhosis	6	4.6
Alcoholic cirrhosis with hepatitis B	5	3.8
Cryptogenic	27	20.6
De novo	18	13.7
Cirrhosis		
Yes	95	86.3
No	36	13.7
Tumor distribution		
Solitary	82	62.6
Multifocal	49	37.4
Tumor location		
Unilobar	114	87.0
Bilobar	17	13.0
Prior treatment		
None	105	80.2
Liver resection	11	8.4
Radiofrequency ablation	16	12.2
Percutaneous ethanol injection	3	2.3

Imaging Technique and Analysis

Patients underwent multiphasic contrast-enhanced CT on either a 16-slice or a 64-slice multidetector CT scanner with images acquired in the precontrast, arterial, portal venous, and delayed phases. Arterial phase scans were acquired using bolus tracking technique. Portal venous phase scans were obtained approximately 65–70 seconds after intravenous administration of contrast material, and delayed phase scans were obtained 60 seconds after the portal venous phase scans. In all patients, 135–150 mL of nonionic iodinated contrast material was injected intravenously at 4 mL/s. A maximum slice thickness of 5 mm was used for scanning (1.25–2.5 mm for the arterial phase, 2.5–5 mm for the portal venous phase). As shown in Figure a, contrast-enhanced CT is able to demonstrate thrombosis in the main portal vein.

MR imaging was performed on a 1.5-tesla system. Unenhanced T1-weighted and T2-weighted and gradient echo images were acquired with phased-array coils. Slice thickness ranged from 5–8 mm. After administration of 20 mL of gadolinium contrast material, dynamic contrast-enhanced sequences (repetition time/echo time, 150–200 s/1.8–4.2 s) were performed in the arterial (20-s scanning delay), portal venous (70-s scanning delay), and equilibrium phases (180-s scanning delay).

CT and MR images were evaluated on the picture archiving and communication system by radiologists with > 4 years of radiology experience. The reviewers were blinded, and the images of each subject were evaluated for the presence of PVT. AP images (if obtained) were reviewed for filling defects that would suggest PVT. The first CT and MR images obtained after transarterial chemoembolization were reviewed for PVT that developed in the time interval between the studies.

Imaging before transarterial chemoembolization (contrast-enhanced CT, n = 194; MR imaging, n = 49) and after transarterial chemoembolization (contrast-enhanced CT, n = 209; MR imaging, n = 34) was performed. The mean time interval between imaging before transarterial chemoembolization and the transarterial chemoembolization procedure was 46.5 days (range, 0–161 d), and mean time interval between the transarterial chemoembolization procedure and imaging after