

Portal Vein Embolization before Right Hepatectomy or Extended Right Hepatectomy Using Sodium Tetradecyl Sulfate Foam: Technique and Initial Results

Aaron M. Fischman, MD, Thomas J. Ward, MD, Jeremy C. Horn, MD, Edward Kim, MD, Rahul S. Patel, MD, F. Scott Nowakowski, MD, FSIR, and Robert A. Lookstein, MD, FSIR

ABSTRACT

Purpose: To evaluate the safety and efficacy of portal vein embolization (PVE) with sodium tetradecyl sulfate (STS) foam.

Materials and Methods: A single-center retrospective review of 35 patients (27 men and 8 women; mean age, 61 y) who underwent PVE with STS foam was performed. The technical success rate, rate of PVE at producing adequate future liver remnant (FLR) hypertrophy, and rate of disease progression precluding resection after PVE were analyzed. Complications of PVE and liver resection after PVE were recorded.

Results: PVE was performed on 35 patients before right hepatic resection for both primary and secondary hepatic malignancies (22 hepatocellular carcinoma, 10 metastasis, 2 cholangiocarcinoma, 1 invasive gallbladder carcinoma). Technical success was achieved in 97.1% (34 of 35) of patients. Mean FLR of the total estimated liver volume increased from 24.5% (SD, 7.7%) to 36.5% (SD, 14.5%), a mean percentage increase of 48.8% (SD, 34.3%). PVE produced adequate FLR hypertrophy in 31 of 35 patients (88.6%). Proposed right hepatectomy was subsequently performed in 27 patients (77.1%). One patient remains scheduled for surgery, two had peritoneal spread at surgery and resection was aborted, two had disease progression on imaging after PVE, and three had inadequate FLR hypertrophy with no surgery. One major complication was observed related to PVE that involved nontarget embolization to segment III, which was managed conservatively.

Conclusions: Preoperative PVE with STS foam is a safe and effective method to induce hypertrophy of the FLR.

ABBREVIATIONS

FLR = future liver remnant, LPV = left portal vein, NBCA = *N*-butyl cyanoacrylate, PVE = portal vein embolization, RPV = right portal vein, STS = sodium tetradecyl sulfate, TELV = total estimated liver volume

From the Division of Interventional Radiology, Department of Radiology, Icahn School of Medicine at Mount Sinai, Mount Sinai Medical Center, One Gustave L. Levy Place, Box 1234, New York, NY 10029. Received December 17, 2013; final revision received January 29, 2014; accepted January 30, 2014. Address correspondence to A.M.F.; E-mail: aaron.fischman@mountsinai.org

From the SIR 2013 Annual Meeting.

A.M.F. is a paid consultant for Terumo Interventional Systems, Surefire Medical, and Celonova Biosciences and gives industry-sponsored lectures for Philips Healthcare. E.K. gives industry-sponsored lectures for Philips Healthcare and Amgen and is a paid consultant for Biocompatibles, Inc. R.S.P. is a paid consultant for Arstasis and SIRTeX. R.A.L. is a paid consultant for Cordis and Bayer Healthcare, gives industry-sponsored lectures for Boston Scientific, and serves on the scientific advisory board for Boston Scientific. None of the other authors have identified a conflict of interest.

© SIR, 2014

J Vasc Interv Radiol 2014; 25:1045–1053

<http://dx.doi.org/10.1016/j.jvir.2014.01.034>

Complete resection of hepatic tumors is the preferred treatment for many primary and metastatic liver malignancies and often provides the best survival outcomes (1,2). However, potential candidates initially may be considered unresectable if the anticipated future liver remnant (FLR) volume is too small to support liver function postoperatively (3). Specifically, in patients with normal liver function, morbidity increases when the residual liver volume is < 20% of the total estimated liver volume (TELV) (4). A predicted FLR of 31%–40% is considered necessary in patients with impaired liver function, steatosis, or a history of hepatotoxic chemotherapy treatment (5–7), and an FLR of at least 40% is recommended in patients with cirrhotic livers (8).

First described as a preoperative technique in Japan in 1986 (9), portal vein embolization (PVE) is an accepted

method of inducing FLR hypertrophy before right hepatectomy. By increasing the FLR, PVE aids in decreasing the risk of postoperative liver failure, allowing for curative treatment (10). Inducing adequate FLR hypertrophy in a timely fashion is critical because a delay in surgical resection can allow for disease progression, precluding cure (11–13).

Many different substances have been used for PVE, including absorbable gelatin sponges, *N*-butyl cyanoacrylate (NBCA), polyvinyl alcohol particles, trisacryl spheres, coils, AMPLATZER Vascular Plugs (St. Jude Medical, St. Paul, Minnesota), absolute alcohol, and polydocanol (14–22), with various results in safety and degree of FLR hypertrophy. There is no current consensus regarding the most appropriate embolic agent (23). Sodium tetradecyl sulfate (STS) is a liquid sclerosant that is an attractive embolic agent because of its low cost and ease of use. It can be converted into foam by vigorous mixing with air. As an anionic surfactant, it acts on lipid molecules in the endothelium to cause intimal inflammation and sclerosis (24,25). The foam preparation is a more effective sclerosant at lower concentrations than the liquid form because of increased contact with the vascular endothelium (26). Sclerosing foam has been studied extensively as an agent used in the treatment of varicose veins and gastric varices (27,28). The purpose of this study was to evaluate the feasibility of STS foam as an embolic agent in preoperative percutaneous transhepatic PVE.

MATERIALS AND METHODS

This single-center retrospective review was approved by the local institutional review board. From September 2011 through October 2013, 50 consecutive patients underwent PVE before right or extended right hepatectomy. In 35 patients (27 men and 8 women; mean age, 61 y; range, 32–78 y) with primary or secondary liver malignancies, preoperative PVE using STS foam was performed. Because of unsuitable portal vein anatomy, 15 patients were not candidates for PVE with STS foam. PVE with STS foam requires temporary balloon occlusion of the proximal right portal vein (RPV) for safe administration of STS foam. RPV minimum length and maximum diameter of 10 mm and 14 mm, respectively, were required because of the maximum size of the occlusion balloon chosen for this technique. Portal vein measurements were obtained on contrast-enhanced computed tomography (CT) scan or magnetic resonance imaging performed before embolization. In no patients was PVE with STS foam performed because of inadequate hypertrophy after PVE with a different embolic agent.

Patient Selection

At our institution, preoperative PVE is performed in patients with resectable right hepatic lobe primary or

metastatic malignancies when the planned FLR is < 20% of the TELV in patients without cirrhosis, steatosis, or history of hepatotoxic chemotherapy treatments. PVE is also performed in patients with steatosis or hepatotoxic chemotherapy treatments and FLR < 30% or cirrhotic patients with FLR < 40%. PVE is not considered in patients with extrahepatic tumors, Child-Pugh class B or C cirrhosis, portal vein occlusion, portal hypertension, evidence of intrahepatic venovenous or arteriovenous fistula, uncorrectable coagulopathy, or renal failure requiring dialysis (8,29). Simultaneous chemotherapy was not a contraindication for inclusion in this experience.

Liver Volumetric Measurements

Contrast-enhanced CT scan or magnetic resonance imaging was performed before and after embolization in all patients to calculate FLR. TELV was calculated based on the previously described and validated equation: $-794.41 + 1,267.28 \times \text{body surface area}$ (4,7). Evaluation of FLR was determined by tracing the individual hepatic segments using three-dimensional volumetric reconstruction software (Vitreacore; Toshiba American Medical Systems, Tustin, California). FLR measurements were performed by a dedicated post processing technologist with 5 years of experience in three-dimensional volumetrics. Absolute increase in FLR% was calculated as follows: $\text{FLR}(\text{post})/\text{TELV} - \text{FLR}(\text{pre})/\text{TELV}$. The percentage increase in FLR after embolization was calculated according to the formula: $\text{FLR}(\text{post}) - \text{FLR}(\text{pre})/\text{FLR}(\text{pre}) \times 100\%$.

FLR hypertrophy was considered adequate if the FLR/TELV increased above the threshold which PVE would not be performed: > 20% in patients with otherwise healthy livers, > 30% in patients with steatosis or prior chemotherapy treatments, and > 40% in cirrhotic patients (4,8). In patients in whom an extended right hepatectomy was performed or planned, the FLR did not include segment IV. In patients in whom surgery spared segment IV, the FLR calculation included this segment. If segment IVa or IVb was included in the resection, one half of segment IV volume was included in FLR calculation. The caudate lobe was involved with disease in one patient. Surgical resection of this lobe was planned with the caudate lobe not included in FLR calculation.

Procedure

Five interventional radiologists at the institution performed PVE using intravenously administered fentanyl and midazolam and a local anesthetic (1% lidocaine). A percutaneous transhepatic ipsilateral approach to the RPV branch was performed with ultrasound or fluoroscopic guidance in all patients. All patients received 1 g ceftriaxone prophylactically. The portal vein was accessed by puncture with a 21-gauge Chiba needle (Neff Percutaneous Access Set; Cook, Inc, Bloomington, Indiana). The Seldinger technique was used to place a 7-F (12)

Download English Version:

<https://daneshyari.com/en/article/4238090>

Download Persian Version:

<https://daneshyari.com/article/4238090>

[Daneshyari.com](https://daneshyari.com)