



Figure 1. Fluoroscopic image (**1A**) obtained immediately after LVD and contrast-enhanced coronal CT (**1B**) obtained 14 days after LVD. Note the vascular plug (red arrows) placed in the right hepatic vein for proximal embolization and NBCA plus lipiodol occluding the distal branches (yellow arrows). Note also NBCA plus lipiodol occluding a venovenous collateral (green arrows) and right portal vein embolization with NBCA plus lipiodol (white arrow).

However, segment IV embolization is controversial: the segment IV portal branches are usually numerous and tiny, which increases the procedure time and the degree of technical difficulty; liquid embolic agents are trickier to use, because any reflux would cause nontarget embolization of liver segments II and III; due to the degree of technical difficulty, suboptimal embolization of segment IV might be an issue⁽⁹⁾; and segment IV is the main territory for systemic-portal venous shunts, possibly decreasing the efficacy of the procedure⁽¹⁰⁾. To overcome the limitations of PVE of segment IV, a more aggressive form of LVD has been proposed—extended LVD⁽¹¹⁾—which consists of LVD plus middle hepatic vein embolization. Extended LVD has been shown to be safe and highly effective, promoting an unparalleled 53.4% increase in liver volume within only seven days⁽¹¹⁾.

Future studies focusing on patient selection are needed. When and how to choose from such a variety of interventional tools? How to best predict post-hepatectomy liver failure? How can we choose between volumetric computed tomography and liver function studies (e.g., ^{99m}Tc-mebrofenin hepatobiliary scintigraphy, gadoxetic acid-enhanced magnetic resonance imaging, and indocyanine green retention test)—or should we perform both? Most importantly, when is the liver ready for major surgery? How can we safely accelerate this preoperative process? Answering such questions are the reason for having multidisciplinary team meetings that allow personalized medical care, with input from different medical perspectives. We want to congratulate the authors not only for obtaining a regenerative outcome that allowed successful major hepatectomy within 41 days after embolization but also for highlighting the potential role and advantages of LVD versus PVE, providing grounds to expand future studies in this field⁽¹²⁾.

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Reply

We received with great enthusiasm the Letter to the Editor “Portal vein embolization, biembolization, and liver venous deprivation”, authored by Dr. Luz and Dr. Bilhim. We certainly agree that the precise nomenclature for the procedure described in our paper should be “Portal vein embolization with hepatic vein biembolization”. The added technique of distal embolization of the hepatic veins, described in liver venous deprivation, would likely represent further liver hypertrophy and probably better hepatic functionality than those achieved in the case we described. Our group has now standardized liver venous deprivation with a transhepatic approach as the technique of choice in such cases. In regard to the issue of hepatic segment IV embolization, we are of the same opinion (that it presents a technical challenge to the PVE procedure), and extended LVD with middle hepatic vein, rather than segment IV embolization, is now the preferred method in our department. Nevertheless, the theme of combined PVE and LVD (or biembolization) raises multiple questions and concerns, which will likely be addressed by prospective multicenter studies and collaborative multidisciplinary discussions to optimize medical care for the affected patients. We want to thank the authors for their interest in our paper, as well as for the perfectly highlighted issues, which further elevate the level of scientific debate in the area of interventional radiology.

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