

# Ultrasound-only needle guidance for portal vein embolization

## Philips EPIQ image fusion and navigation case study

Portal vein embolization (PVE) is used to redirect portal blood flow away from the portion of the liver targeted for resection towards the anticipated future liver remnant (FLR) and usually results in FLR hypertrophy. PVE is indicated when the FLR is considered too small prior to surgical resection to support essential function post-operatively. When successfully performed, PVE reduces postoperative morbidity and increases the number of patients eligible for curative hepatic resection.

PVE is usually performed under fluoroscopic guidance and involves advancing a needle under fluoroscopic guidance from the right and injecting contrast media until the operator visualizes the portal veins. This is usually accomplished after several passes of the needle. With ultrasound guidance, this is easily achieved from the left lobe. However, most access is achieved from the right lobe, as this leads to minimal damage to the FLR, usually the left. The utility of ultrasound is greatly diminished from the right due to the ribs obscuring the visualization of liver parenchyma.

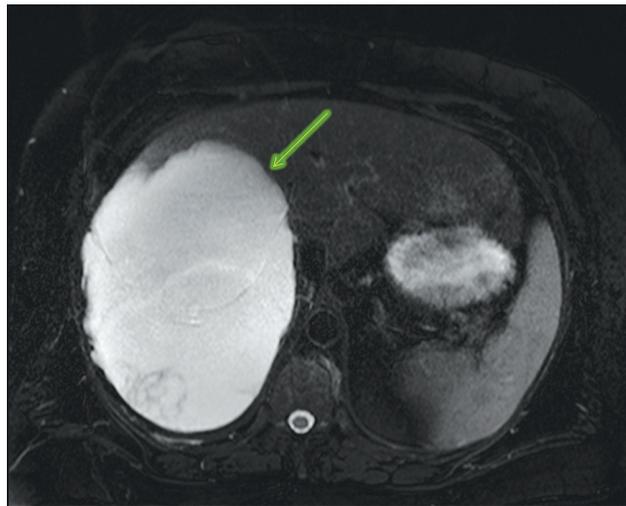
The Philips image fusion and navigation system demonstrates its clinical utility for a technically challenging case by displaying the needle trajectory in real time, to facilitate an effective approach for needle access into the right portal vein for PVE.



**PHILIPS**

### Patient history

A 45-year-old female with abdominal pain from a cystadenocarcinoma in the right lobe of the liver.



**MRI of cystadenocarcinoma**

The plan of care was right lobe resection. However, the left lobe of the liver needed compensatory hypertrophy prior to resection and portal vein embolization was planned.

**Total bilirubin: 0.7**

**INR: 1.1**

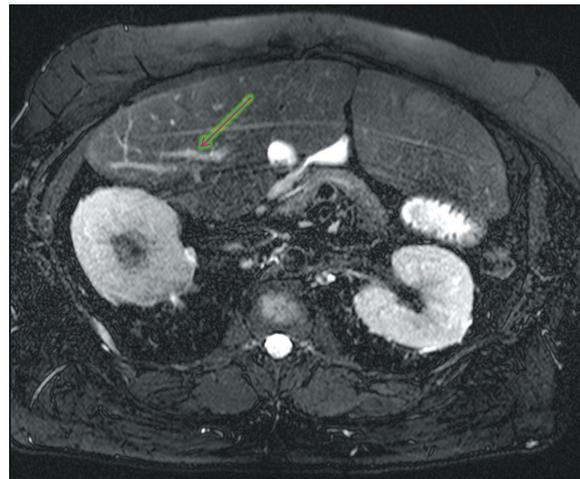
**Platelets: 302**

Due to the large 17 cm lesion in the right lobe of the liver with internal enhancing components, this imposed a great technical challenge for access to the right portal vein.

A branch of the right portal vein is visualized on the MR abdomen in portal venous phase just inferior to the cystadenocarcinoma, but access is challenging. Inadvertant puncture of the cystadenocarcinoma could lead to peritonitis, hemorrhage, or infection. Contralateral access through the left portal vein was contemplated, but undesirable due to potential damage to the FLR.

A strong emphasis was made on precise needle placement under ultrasound guidance to obviate any complications.

A branch of the right portal vein was confirmed under ultrasound guidance with color Doppler.

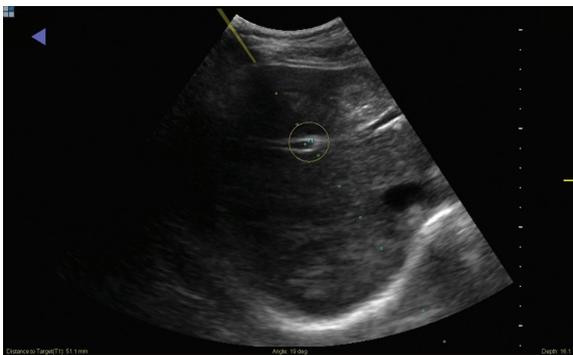


**Portal vein**

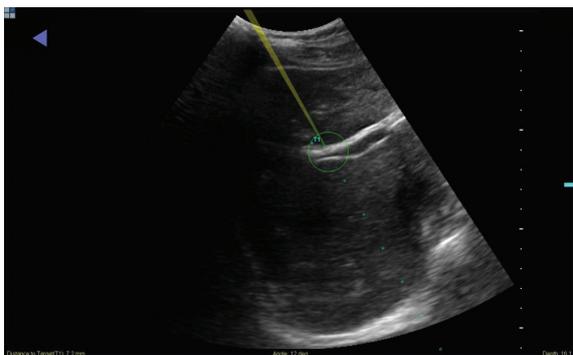
In addition, an out-of-plane entry point was determined to ensure the projected needle path would avoid critical areas.



**Trajectory planning**



**Needle advancement**



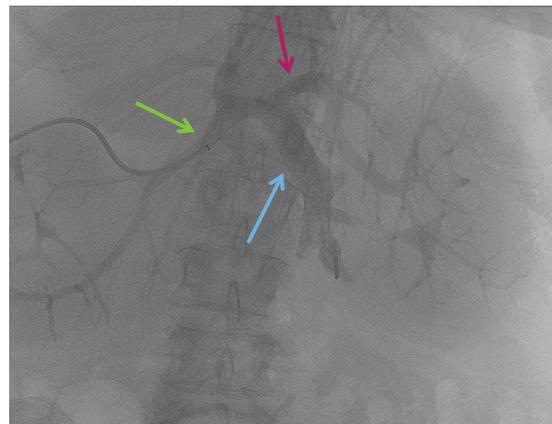
**Needle at target, access into the right portal vein**

A single pass was achieved with ultrasound targeting and confirmed with fluoroscopy. Of note, a 19 gauge needle was used and an 035 wire was advanced, instead of the usual 018, which decreased fluoroscopy time, as well as procedure time.



**Initial access into right portal vein**

A confirmatory rollscan was performed to map out the entire portal veins.



**Confirmatory rollscan**

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