Endoscopic ultrasound-guided portal-systemic pressure gradient measurement

Portal hypertension is defined by the hepatic venous pressure gradient and is measured via a percutaneous transhepatic route [1]. We describe a novel technique for direct portal pressure measurement using endoscopic ultrasound (EUS).

A 27-year-old man with Noonan syndrome and congenital heart disease presented with recurrent gastrointestinal bleeding, which continued despite cardiac surgery. A mesenteric angiography demonstrating the gastroduodenal artery (orange arrow), a replaced right hepatic artery (yellow arrow), and a branch communicating the replaced right hepatic artery to the gastroduodenal artery (green arrow). Given that the periduodenal vessels could not be visualized, coils were prophylactically placed in the gastroduodenal artery (orange arrow) and communicating branch (green arrow).

EUS revealed an extensive network of periduodenal vessels that were attributed to congestive hepatopathy. However, bleeding continued despite cardiac surgery. Angiography failed to visualize these vessels, but the gastroduodenal artery and adjacent aberrant vessel were embolized prophylactically (Fig. 1). Clinically significant bleeding continued leading to EUS-guided insertion of 20 coils into the periduodenal vessels. EUS Doppler demonstrated both arterial and venous components (Fig. 2). Follow-up imaging revealed a marked improvement of the vascular malformations (Fig. 3a, b) with only occult, but transfusion-requiring bleeding remaining. EUS was repeated with only one vessel large enough to allow coiling.

Given continued uncertainty with regard to the prior hepatic venous pressure gradient and diagnosis, EUS was used to re-measure the portal pressure. The portal vein was accessed using a 22-gauge fine needle aspiration (FNA) needle (Wilson-Cook Medical Inc., Winston-Salem, North Carolina, United States). Portal blood was aspirated through the needle, which was connected to an arterial pressure catheter (Fig. 4a, b, Fig. 5a). After calibration, the portal pressure measured 11mmHg, thereby excluding significant portal hypertension. The middle hepatic vein pressure was then measured at 10mmHg (Fig. 4c, d, Fig. 5b), confirming a 1mmHg pressure gradient as recorded by interventional radiology.

There was no evidence of bleeding and the hemoglobin was stable 4 days later. Prior EUS-guided portal pressure measurements in porcine models correlated with percutaneous measurements [2–4]. This is the first clinical report demonstrating the feasibility and apparent safety of portal vein and hepatic vein pressure measurements by EUS, thereby allowing diagnosis of arteriovenous malformations as have been reported in Noonan syndrome [5].

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Fig. 3  
(a) Routine endoscopy revealed multiple duodenal serpiginous folds before therapy. 
(b) Their appearance following EUS-guided coil insertion therapy.

Fig. 4  
(a) EUS demonstrates the portal vein with power Doppler imaging. 
(b) Fine needle aspiration (FNA) needle position during pressure monitoring.

**Bibliography**

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