Utility of minimally invasive measurement of hepatic venous pressure gradient via the peripheral antecubital vein

We read with great interest the three articles by Bosch,[1] Tripathi,[2] and Monteiro.[3] In those articles, measurement of hepatic venous pressure gradient (HVPG) played a key role in assessing the portal hypertension in patients with advanced liver disease. One obstacle to examining portal hypertension in clinical trials with suitably large cohorts is the substantial barrier to repeated measurement of HVPG. HVPG measurement is performed using a balloon catheter, most frequently inserted from the jugular vein. HVPG measurement is considered to require specific expertise and around a day of hospitalisation, making the procedure relatively expensive and burdensome.[4 5] Despite many attempts, non-invasive methods have not yet been able to completely replace direct HVPG measurement.[5 6] Here, we report a study on the methods for HVPG measurement from the peripheral antecubital vein (pHVPG). Although this method has been mentioned in a review of HVPG measurement, no detailed descriptions of this approach have been published.[4]

Forty-one measurements from 37 consecutive patients who underwent pHVPG measurement in our institute between October 2018 and February 2020 were evaluated. This retrospective study was approved by our institutional review board. The system involved introduction of a catheter into the right or left antecubital vein with a 5-Fr sheath. Through the sheath, a 5-Fr cobra-shaped balloon catheter was advanced to the hepatic vein. HVPG measurement was performed as per the standard protocol for the jugular vein.[6 7] Complications during and after

Table 1 Characteristics of the 41 measurements and liver function before measurements

Demographic characteristics	
All measurements, n	41
Wedge hepatic venous pressure, mm Hg (n=40)*	23.5 (11–37)
Free hepatic venous pressure, mm Hg (n=40)*	8.5 (1–23)
Hepatic venous pressure gradient, mm Hg (n=40)*	14.0 (3–23)
Total bilirubin, mg/dL (n=41)	1.1 (0.1–10.1)
Albumin, g/dL (n=41)	3.3 (1.7–4.6)
Prothrombin time, % (n=38)	78.5 (48–133)
Prothrombin time international normalised ratio (n=38)	1.1 (0.87–1.46)
Platelet count, $\times 10^4/\mu L$ (n=41)	11.1 (3.3–23.6)
Aspartate aminotransferase, U/L (n=41)	36 (11–175)
Alanine aminotransferase, U/L (n=41)	22 (5–140)
Serum creatinine, mg/dL (n=41)	0.8 (0.4–1.7)
Serum sodium, mmol/L (n=39)	139 (130–143)
Model for end-stage liver disease score (n=37)	7 (6–14)
Child-Pugh score (n=38)	7 (5–10)
Child-Pugh classification (n=38), n (%)	
A	16 (42)
B	19 (50)
C	3 (8)
Non-invasive markers of liver fibrosis	
Lok index (n=41)	0.83 (0.003–0.99)
Albumin–bilirubin score (n=41)	−1.9 (−0.8 to −3.1)
Albumin–bilirubin grade, 1/2/3 (n=41)	(7/25/9)
Procedure time, min (n=40)*	19.1 (8.7–56)
Hospitalised/clinic (n=41)	29/12

Values are given as median (range) or number.
*Hepatic venous pressure gradient measurement was failed to perform in one patient.

pHVPG measurement were also evaluated. The resulting HVPG was compared with liver function values and fibrosis markers.

Characteristics of the 41 measurements are listed in the table 1. Four patients underwent two measurements of HVPG. Twenty-nine measurements were carried out in-hospital and 12 measurements on an outpatient basis. Successful measurement of pHVPG was achieved in 40 of the 41 procedures (98%) (figure 1). A representative example of the procedure is shown in the online supplementary data. We failed to perform pHVPG measurement in one patient, who showed occlusion of bilateral subclavian veins. Median procedure time was 19.1 min (range 8.7–56 min). No patients experienced complications

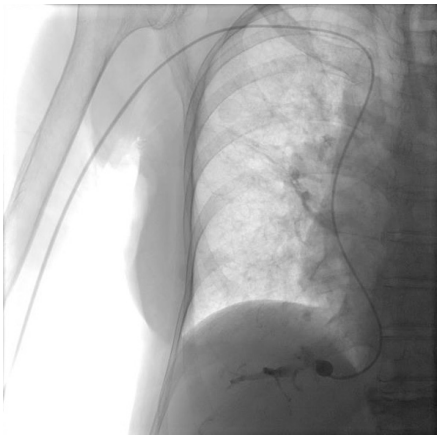

Figure 1 Chest and abdominal X-rays during hepatic venous pressure gradient measurement in procedure 28. The balloon catheter is inserted via the right cephalic vein. The catheter is inserted into the right hepatic vein. The balloon is inflated, and stasis of injected contrast medium is identified.

such as large haematoma or nerve injuries. Four records were excluded because of venous–venous communication, which led to underestimation of HVPG.[8] Significant positive correlations were found between pHVPG and albumin–bilirubin score (r=0.34, p=0.04), Child-Pugh score (r=0.40, p=0.02), model for end-stage liver disease score (r=0.38, p=0.03) and Lok index (r=0.38, p=0.02). A significant negative correlation was found between pHVPG and platelet count (r=−0.37, p=0.03).

Although limitation of this study was the relatively small size of the patient cohort, this study showed that pHVPG measurement appears safe and feasible, with a high success rate (98%) and short procedure time (median 19.1 min). The HVPG values correlated well with liver function values and fibrosis markers, similar to the case of HVPG measurement from the jugular vein.[9] An important benefit of pHVPG measurement is that the puncture of antecubital veins is markedly safer than the puncture of a jugular vein. Haemorrhage in the arm as a potential complication is considered controllable without severe outcomes, even in patients with bleeding tendency. This technique does not necessitate a long rest after the procedure or careful observation of the puncture site under admission. Measurement of pHVPG could thus be repeatedly applied to outpatients. As reported, HVPG measurement is available only in specialised hepatology units.[4 6] The technique needs to be able to be performed by hepatologists similar to the performance of transjugular liver biopsy to achieve further expansion of HVPG measurement.[10] This technique could offer a useful alternative to conventional HVPG measurements.

Akira Yamamoto ,[1] **Norifumi Kawada,**[2] **Atsushi Jogo,**[1] **Kazuki Murai,**[1] **Kohei Kotani,**[2] **Ken Kageyama,**[1] **Shinichi Hamamoto,**[1] **Etsuji Sohgawa,**[1] **Sawako Uchida-Kobayashi,**[2] **Masaru Enomoto,**[2] **Akihiro Tamori** ,[2] **Yukio Miki**[1]

[1]Department of Diagnostic and Interventional Radiology, Graduate School of Medicine, Osaka City University, Osaka, Japan
[2]Department of Hepatology, Graduate School of Medicine, Osaka City University, Osaka, Japan

Correspondence to Professor Norifumi Kawada, Hepatology, Osaka City University Graduate School of Medicine School of Medicine, Osaka, Japan; kawadanori@med.osaka-cu.ac.jp

Contributors Concept and design: NK and AY. Acquisition of data: AY. Analysis and interpretation of data: AY. Patient recruitment: KoK, SU, ME and AT. Procedure: AY, AJ, KM, KaK, SH and ES. Critical revision of the manuscript: AJ, KoK, SU, ME, AT and YM. Study supervision: YM.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; internally peer reviewed.

To cite Yamamoto A, Kawada N, Jogo A, *et al*. *Gut* 2021;**70**:1199–1201.

Received 1 July 2020
Revised 29 July 2020
Accepted 30 July 2020
Published Online First 18 August 2020

Gut 2021;**70**:1199–1201. doi:10.1136/gutjnl-2020-322367

ORCID iDs
Akira Yamamoto http://orcid.org/0000-0002-4567-9745
Akihiro Tamori http://orcid.org/0000-0001-9119-4864

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