

Correlation of hepatic venous pressure gradient with variceal bleeding, size of esophageal varices, etiology, ascites and degree of liver dysfunction in cirrhosis of liver

Ghulam Mohamad Gulzar · Showkat Ali Zargar · Sheikh Jalal · Mohamad Sultan Alaie · Gul Javid · Pawan Kumar Suri · Nisar Ahmad Shah · Bilal-ul-Rehman · Mohamad Shafi Hakeem · Abid Shoukat · Gulzar Ahmad Dar

Abstract

An elevated hepatic venous pressure gradient (HVPG) has been associated with risk of variceal bleeding, and outcome and survival after variceal bleeding. In this pilot study, we measured HVPG in 40 patients with liver cirrhosis and studied its relationship with etiology of liver disease, esophageal variceal size, history of variceal bleeding or ascites, biochemical liver tests and Child-Pugh class. There was no procedure-related complication. The mean (SD) HVPG was similar in patients who had history of variceal bleeding as compared to those who did not (15.4 [2.8] mmHg vs. 13.9 [2.7] mmHg, $p=0.1$); HVPG had no significant association with etiology of cirrhosis ($p=0.4$). HVPG levels were significantly higher in patients with larger esophageal varices (grade III/IV vs. I/II: 15.2 [2.7] mmHg vs. 13.1 [2.8] mmHg, $p=0.04$), poorer Child-Pugh class (B or C versus A), and presence of ascites ($p=0.04$). Thus, HVPG correlated with variceal size, Child-Pugh class, and presence of ascites, but not with variceal bleeding status.

Keywords Child-Pugh score · Liver disease · Portal hypertension

Introduction

Hepatic venous pressure gradient (HVPG), calculated as the difference between wedged hepatic venous pressure (WHVP) and free hepatic venous pressure (FHVP) provides an accurate estimate of portal venous pressure (PVP) in most patients with liver cirrhosis. Compared to the PVP, its measurement is easy, safe, less invasive and more reproducible. Though HVPG measurement has been shown to be associated with the risk of variceal bleeding, clinical outcome, survival and degree of liver failure, other studies have failed to show this association; the prognostic value of its measurement is unclear.^{1–6} In this study, we assessed the relationship of HVPG in patients with cirrhosis of liver with etiology of disease, size of esophageal varices, risk of variceal bleeding, ascites, serum bilirubin and albumin, and degree of liver failure.

Methods

Between March 2006 and December 2007, 40 consecutive patients (mean [SD] age 43 [11.8] years, range 18–65 years; 24 men) with cirrhosis of liver with portal hypertension (hepatitis B or C 15, cryptogenic 25) were studied. The diagnosis of liver cirrhosis was based either on histology or on unequivocal clinical, biochemical and ultrasound findings. The study protocol was approved by an Ethics Committee and study participants gave written consent. Exclusion criteria included cardiac, renal, or cerebrovascular disease, pregnancy, superimposed current acute viral or drug-induced liver injury, bleeding diathesis, use of vasoactive drugs in previous two weeks, or recent clinical instability, spontaneous bacterial peritonitis, encephalopathy or active bleeding. Esophageal varices were assessed one week before HVPG measurement and classified based on their diameter: grade I – 3 mm or less, grade II – 4–6 mm, grade III – 7–10 mm, and grade IV – 11 mm or more.⁷ Fifteen patients had prior history of variceal bleeding.

Hepatic vein catheterization was done after an overnight fast and under conscious sedation in the supine position. A 7F Swan-Ganz catheter (Arrow International, Reading, PA, USA) was inserted in the right femoral vein under local anesthesia using the Seldinger technique, and advanced

G. M. Gulzar · S. A. Zargar · S. Jalal · M. S. Alaie · G. Javid · P. K. Suri · N. A. Shah · B. Rehman · M. S. Hakeem · A. Shoukat · G. A. Dar
Departments of Gastroenterology and Cardiology,
Sher-i-Kashmir Institute of Medical Sciences,
Srinagar 190 011, India

S. A. Zargar (✉)
e-mail: showkatzargar6@gmail.com

Received: 11 June 2008 / Revised: 13 January 2009 /
Accepted: 22 February 2009

© Indian Society of Gastroenterology 2009

into the right hepatic vein under fluoroscopic guidance. FHVP was recorded on monitor (AXIOM-ARTIS Cine Angiographic System; Siemens) approximately 3–4 cm away from the inferior vena cava. WHVP was then measured after inflating the balloon on the catheter taking care that the catheter's position did not change. The wedged position was subsequently confirmed by the absence of reflux after injection of 1–2 ml. of contrast through the catheter. Two readings were taken and their mean was used. During the procedure, heart rate, blood pressure, pulse oximetry and ECG were continuously monitored. Antiseptic dressing was applied, and patient shifted back to ward.

Numerical data were expressed as mean [SD] and compared using Student's *t* test or Mann-Whitney *U*-test, as appropriate. Categorical data were compared using *Chi*-square test or Fisher's exact test. Two-tailed *p* values of <0.05 were considered significant.

Results

Table 1 shows the laboratory findings in the study patients. No patient developed any procedure-related complication.

Table 1 Laboratory test findings in study patients

Laboratory parameter	Mean (SD)
Hemoglobin (g/dL)	10.7 (1.5)
Platelet (thousand/L)	89 (40)
Serum albumin (g/dL)	3 (0.6)
Serum bilirubin (mg/dL)	2.1 (1.1)
Creatinine (mg/dL)	1.3 (0.2)
Prothrombin index (%)	80.8 (16.3)
Alanine transaminase (IU/L)	68 (25)

Table 2 Relationship of HVPG with etiology of liver disease, bleeding status, variceal score, ascites, serum albumin and bilirubin and degree of liver dysfunction

Parameter	Value	Number of cases	HVPG (mmHg)	p value
Etiology	Post-viral	15	14.6 (2.0)	0.43
	Cryptogenic	25	15.3 (3.1)	
History of bleeding	Yes	15	15.4 (2.8)	0.10
	No	25	13.9 (2.7)	
Ascites	Present	20	15.7 (2.4)	0.04
	Absent	20	13.9 (3.1)	
Variceal grade	I-II	13	13.1 (2.8)	0.04
	III-IV	18	15.2 (2.7)	
Serum albumin	<3.5 g/dL	25	15.2 (2.7)	0.7
	≥3.5 g/dL	15	14.8 (3.1)	
Serum bilirubin	<2 mg/dL	16	14.3 (1.2)	0.4
	≥2 mg/dL	24	15.1 (3.4)	
Child-Pugh class	A	15	14.6 (3.0)	0.04
	B	14	16.9 (2.6)	
	C	11	17.2 (3.2)	

Data are as mean (SD)

All patients had moderate to severe portal hypertension. Their mean HVPG was 15.1 (2.8) mmHg (range 10–23). FHVP and WHVP were 6.8 (3.1) (range 2–11) and 21.9 (4.2) (range 14–28) mmHg, respectively. Table 2 shows data on relationship of HVPG with various clinical and laboratory findings. HVPG had no significant association with etiology of cirrhosis, or history of variceal bleeding. However, HVPG was higher among patients with Child-Pugh classes B and C compared to class A, and those with ascites or larger varices.

Discussion

We studied HVPG in 40 patients with liver cirrhosis either cryptogenic or due to hepatitis B or C. We did not study patients with alcoholic cirrhosis, since this condition is rare in our population. All our patients had significant portal hypertension, as indicated by HVPG exceeding 10 mmHg; this finding is in agreement with that of others.⁸

We found no significant association of HVPG level with the history of bleeding. Previous studies on the relationship of HVPG with risk of bleeding have shown conflicting results.^{4,9} Carlo *et al.* showed that HVPG was an important predictor of bleeding,² with a mean value of 21.7 mmHg in those who bled during follow-up and 19.8 mmHg in those who did not. Others, however, have failed to find a relationship between HVPG and risk of bleeding.^{9,10}

We found a relationship of higher variceal size with higher HVPG; some others^{9,10} have found a similar association but others have not.^{3,11} We also found HVPG to be higher in patients with ascites than in those without. Others have reported a similar association.⁶

Our results indicate that HVPG increased with increasing Child-Pugh class from A to C. Equardo *et al.*¹

found that patients with HVPG >20 mmHg had a higher Child-Pugh score than those with a lower HVPG. Similarly, Patch *et al.* found a positive relationship between the HVPG level and Child-Pugh score.

In conclusion, HVPG can be safely measured in patients with cirrhosis of the liver, and its levels are higher among patients with ascites, larger esophageal varices and poorer Child-Pugh class.

References

1. Moitinho E, Escorsell A, Bandi JC, *et al.* Prognostic value of early measurement of portal pressure in acute variceal bleeding. *Gastroenterology* 1999;117:626–31.
2. Merkel C, Bolognesi M, Bellon S, *et al.* Prognostic usefulness of hepatic vein catheterization in patients with cirrhosis and esophageal varices. *Gastroenterology* 1992;102:973–9.
3. Patch D, Armonis A, Sabin C, *et al.* Single portal pressure measurement predicts survival in cirrhotic patients with recent bleeding. *Gut* 1999;44:264–9.
4. Gludd C, Hensiksen JH, Nielsen G. Copenhagen Study Group for Liver Diseases – prognostic indicators in alcoholic cirrhotic men. *Hepatology* 1988;8:222–7.
5. Stanley AJ, Robinson I, Forrest EH, Jones AL, Hayes PC. Hemodynamic parameters predicting variceal hemorrhage and survival in alcoholic cirrhosis. *QJM* 1998;91:19–25.
6. Wadhawan M, Dubey S, Sharma BC, Sarin SK. Hepatic venous pressure gradient in cirrhosis: correlation with the size of varices, bleeding ascites and Child's status. *Dig Dis Sci* 2006;51:2264–9.
7. Zargar SA, Javid G, Khan BA, *et al.* Endoscopic ligation as compared to sclerotherapy in adults with extrahepatic portal venous obstruction: a prospective randomized study. *Gastrointest Endosc* 2005;61:58–66.
8. Groszmann RJ, Glickman M, Blei AT, Storer E, Conn HO. Wedged and free hepatic venous pressure measured with a balloon catheter. *Gastroenterology* 1979;76:253–8.
9. Lebrech D, De Fleury P, Rueff B, Nahum H, Benhamou JP. Portal hypertension, size of esophageal varices, and risk of gastrointestinal bleeding in alcoholic cirrhosis. *Gastroenterology* 1980;79:1139–44.
10. Joly JG, Marleau D, Legare A, Lavoie P, Bernier J, Viallet A. Bleeding from esophageal varices in cirrhosis of liver: hemodynamic and radiological criteria for the selection of potential bleeders through hepatic and umbilicoportal catheterization studies. *Can Med Assoc J* 1971;104:576–80.
11. Pemier-Layrargues G, Kusielewicz D, Willems B, *et al.* Pre-sinusoidal portal hypertension in non-alcoholic cirrhosis. *Hepatology* 1985;5:415–8.

News and notices

ISG Travel fellowships for Gastro 2009, London

The Indian Society of Gastroenterology is pleased to offer around seven International Travel Fellowships to attend Gastro, 2009 at London to be held between 21–25 November 2009 to young Gastroenterologists (<37 years, members of ISG, submitted an abstract to WCOG, has demonstrable consistent commitment to Gastroenterology based on the candidate's CV). Selection will be done by a panel of judges. Preference will be given to those who have not obtained a travel fellowship from ISG in the last two years.

Aspiring candidates should send copies of their submitted abstracts, CV, and photocopy of their passports to the secretariat by September 30, 2009. Selection results will be announced by early November. A total support amount of Rs 70,000–90,000 will be provided to those selected, on their return and on provision of the following: evidence of attendance, receipt of registration fees, original air-ticket jackets with boarding card and report of their learning experience.

Please note that the last date for submitting abstracts for Gastro, 2009 is 8th June. Please hurry and try to make it for Gastro, 2009. Please also visit the official website of at <http://www.gastro2009.org/> to get details about other travel bursaries, fellowships, early bird registration and registration for trainees. For further details, please visit the ISG website <http://isg.org.in>. Please submit the application before the last date to:

S. P. Misra
Honorary Secretary, ISG
Department of Gastroenterology
MLN Medical College, Allahabad - 211 001, India

E-mail drspmisra@gmail.com