THE VALUE OF PORTAL VEIN FLOW AND HEPATIC ARTERY RESISTANCE IN CIRRHOTIC PATIENTS

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Abstract

Patients and method: 50 patients enrolled in the study at GI department of Hue central Hospital from 6/2013 to 6/2014. The diagnosis of cirrhosis based on the two syndroms: The liver failure and portal hypertension associated with the imaging of sonography or CT scan typically of cirrhosis. Echo Doppler of portal vein and hepatic artery made by the appareil: Doppler HDL 3500 ATL U.S.A; probe 3.5 – 7.5 MHz. Hepatic artery resistance calculate by the formula: RI = . Site of measurement: 2 cm from the confluent of mesenteric and splenic vein, mean value of three times of measurement. **Results:** - Vmax of portal vein: 18.24 ± 3.09 cm/sec, Vmin: 8.05 ± 1.75cm/second, Vmean: 13.15 ± 2.30 cm/sec. -The mean of Portal vein flow: 609.12 ± 177.77 ml/min, the minimum: 380 ml/min, and the max: 1150 ml/min. -The mean of hepatic artery resistance: 0.74 ± 0.05; 78% of cirrhosis had high hepatic artery resistnace. - There was the negative relationship between portal vein flow and the degree of cirrhosis by Child – Pugh score ($r = - 0.59$; $p < 0.001$). - There was the positive relationship between portal vein flow and the degree of esophageal varix with $r_s = 0.34$; $p < 0.05$. There was the Midle positive relation with $r_s = 0.61$; $p < 0.001$. **Conclusion:** The mean speed of portal vein in cirrhosis 13.15 ± 2.30 cm/second. Vmax of portal vein: 18.24 ± 3.09 cm/second. Vmin of portal vein: 8.05 ± 1.75 cm/second. The portal vein flow: 609.12 ± 177.77 ml/min. The hepatic artery resistance: 0.74 ± 0.05, and there was the negative relationship between portal vein flow and the degree of cirrhosis by Child – Pugh score ($r = - 0.59$; $p < 0.001$).

Key words: *P.V.F.: portal vein flow; H.A.R: hepatic artery resistance; M.F.: mean of portal vein flow; E.V.: eosophageal varix.*

1. INTRODUCTION

Portal hypertension is common in cirrhosis, with the consequence of dilatation and esophageal varix and the disturbance in hemo dynamic; in which the esophageal varix rupture and bleeding are very severe and fatal complications. So the study of the portal vein flow and hepatic artery resistance that help to early detection and treatment of portal hypertension, especially in cases without ascitites are very important in prevention portal hypertension, this issue is still having little in Vietnam.

Objectives: To study the portal vein flow and the hepatic artery resistance index as well as the relationship between these index and the severity of cirrhosis through the Child Pugh Scou.

2. OBJECTS AND METHODS

50 cirrhotic patients enrolled in the study from 6/2013 to 6/2014 at the G.I Depart. Hue central Hospital.

2.1. Criteria diagnosis of cirrhosis

Patients with 2 syndroms: Portal hypertension and hepatic failure, associated with imaging signs by U.S or CT Scan: typically of cirrhosis.

Portal hypertension flow and hepatic artery resistance made by Doppler ultrasound of the liver.

Criteria exclusive:

- Portal hypertension none cirrhosis, for example:

+ Budd – Chiari syndrom.

+ Portal vein thrombosis, portal vein compression by tumors.

- Currently drug using: beta bloquants, Sandostatines, Nitres).

- Classification portal dilatation by Japanese Endoscopy Society.

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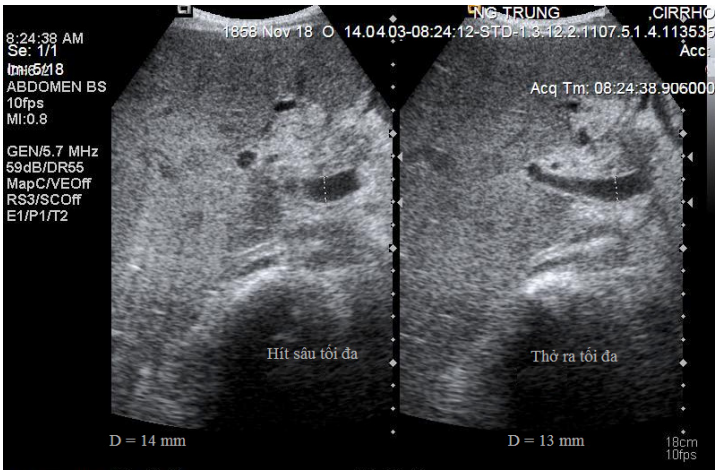
2.2. Doppler U.S of Portal vein

Appareil: Doppler HDL 3500 ATL of U.S.A. Probe: 3.5 – 7.5 MHz.

Normal Portal vein Diameter: 9 – 12 mm.



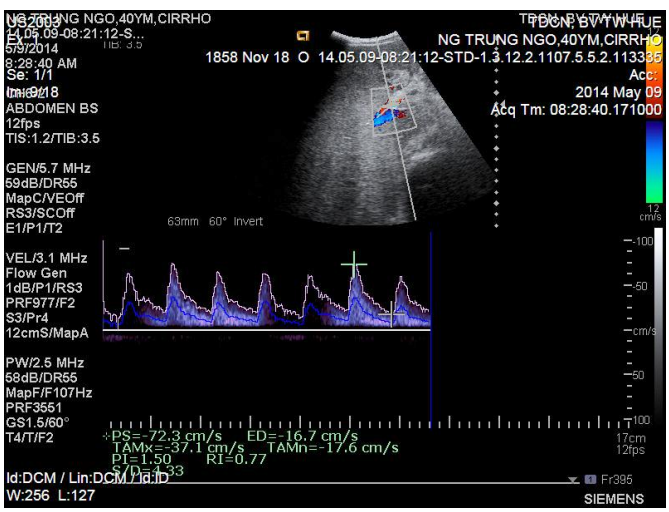
F 1. Portal vein of patient Nguyễn Tr.

* mean portal speed: 12 – 20 cm/sec.

F 2. Portal vein flow of patient Nguyễn Trung Ng, F = 517 ml/mn

2.3. Doppler of Hepatic artery

Resistance index of hepatic artery: $RI = \frac{PSV - EDV}{PSV} = \frac{V1 - V2}{V1}$



F 3. Peak systolic speed, end diastolic speed and resistance index of pts Nguyễn Trung Ng, RI = 0.77.

3. RESULTS

1. Portal vein speed

Table 1. Mean portal vein speed

Portal vein speed	± SD (cm/sec)
Max	18.24 ± 3.09
Min	8.05 ± 1.75
Mean	13.15 ± 2.30

Vmax of portal vein: 18.24 ± 3.09 cm/sec.Vmin: 8.05 ± 1.75cm/sec. Mean speed of portal vein : 13.15 ± 2.30 cm/sec.

3.2. Portal vein flow

Table 2. Mean portal vein flow

Portal vein flow	(ml/Minute)
Min	380
Max	1150
± SD	609.12 ± 177.77

Mean portal vein flow: 609.12 ± 177.77 ml/minute, Min: 380 ml/minute, max: 1150 ml/minute.

3.3. Hepatic artery index

Table 3. Hepatic artery resistance index

RI	n	(%)
> 0.7	39	78.0
Normal: 0.55 - 0.7	11	22.0
< 0.55	0	0.0
Total	50	100.0
± SD	0.74 ± 0.05	
Min	0.62	
Max	0.88	

Mean value of R.I: 0.74± 0.05, most of cirrhosis with R.I increasing (78%). Min of R.I: 0.62; Max of R.I: 0.88.

3.4. Relation between the max speed of portal vein and the severity of cirrhosis by Child Pugh score

Table 4. Relation between the max portal vein speed and the severity of cirrhosis through Child-Pugh score

Child – Pugh	A(1) (n= 4)	B(2) (n = 19)	C(3) (n = 27)
V_{max} Portal vein (cm/s)	22.10 ± 2.96	18.11 ± 3.00	17.76 ± 2.88
p(1.2) < 0.05; p (1.3) < 0.05; p (2.3)>0.05			

There were the relation of the max portal vein speed between Child A and B as so as Child A and C ($p < 0.05$).

3.5. Relation between the mean portal vein speed and the severity of cirrhosis through Child – Pugh score

Table 5. Relation between the mean portal vein speed and Child-Pugh score

Child – Pugh	A(1) (n= 4)	B(2) (n = 19)	C(3) (n = 27)
V_{mean} port V(cm/s)	16.13 ± 2.08	13.00 ± 1.96	12.80 ± 2.30
p(1.2) < 0.05; p(1.3) < 0.05; p(2.3) > 0.05			

There were relation the mean portal vein speed between Child A and Child B ($p< 0.05$) and none significant in Child A and Child C.

3.6. Relation between the hepatic artery resistance (HAR) and the Child pugh score

Table 6. Relation between the hepatic artery resistance and the Child pugh score

Child - Pugh	A(1) (n= 4)	B(2) (n = 19)	C(3) (n = 27)
HAR	0.77 ± 0.08	0.74 ± 0.04	0.73 ± 0.06
p(1.2) > 0.05; p(1.3) > 0.05; p(2.3) > 0.05			

There were n't relation between the hepatic artery resistance and the Child pugh score p > 0.05.

3.7. Relation between the mean portal vein speed and the degree of esophageal varices

Table 7. Relation between the mean portal vein speed and the degree of esophageal varices

Degree of varix	No varix (1) (n = 6)	1(2) (n = 7)	2(3) (n = 11)	3(4) (n = 26)
V_{tb}(cm/giây)	12.07 ± 0.48	14.04 ± 3.44	13.85 ± 2.98	12.86 ± 1.77
p(1,2) > 0.05; p(1,3) > 0.05; p(1,4) > 0.05; p(2,3) > 0.05; p(2,4) > 0.05; p(3,4) > 0.05				

No relation between the mean portal vein speed and the degree of varices p > 0.05.

3.8. Relation between the portal vein flow and the severity of cirrhosis

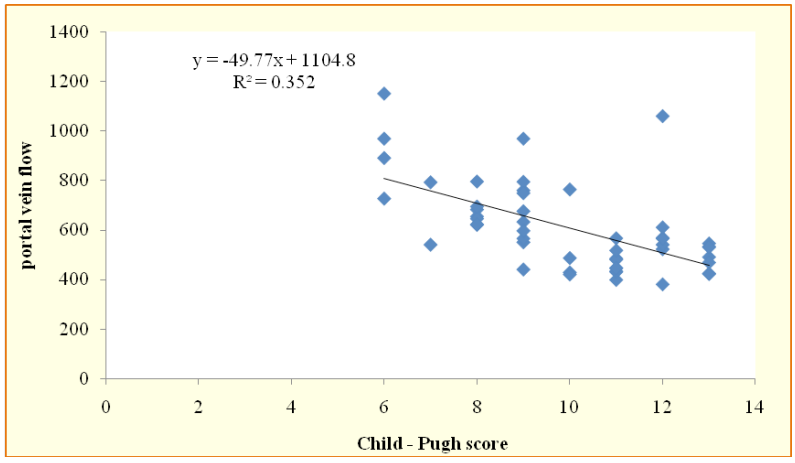


Chart 1. Relation between the portal vein flow and the Child - Pugh

There were the middle relation between the portal vein flow and the severity of cirrhosis by Child - Pugh (r= - 0.59; p < 0.001).

3.9. Relation between the portal vein flow and the esophageal varices

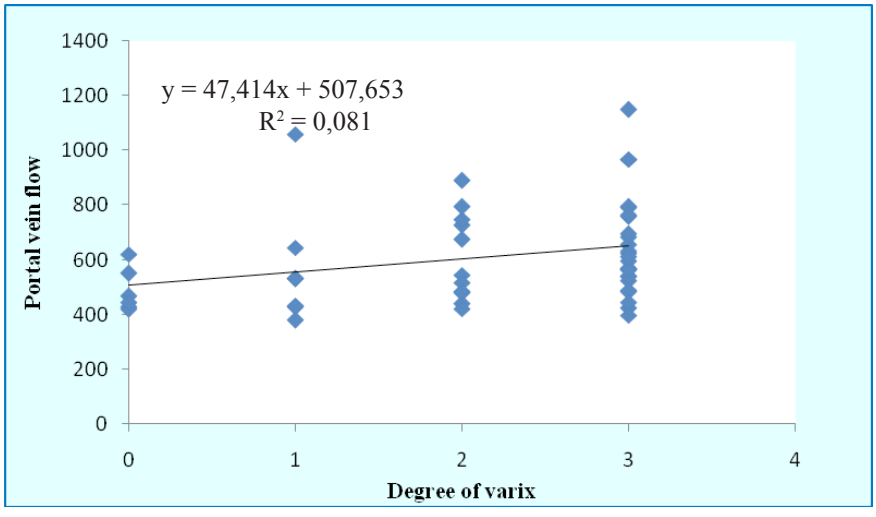


Chart 2. Relation between the portal vein flow and the varices

Positive relation, mild degree $r_s = 0.34$; p < 0.05.

3.10. Relation between the hepatic artery resistance index and the varices

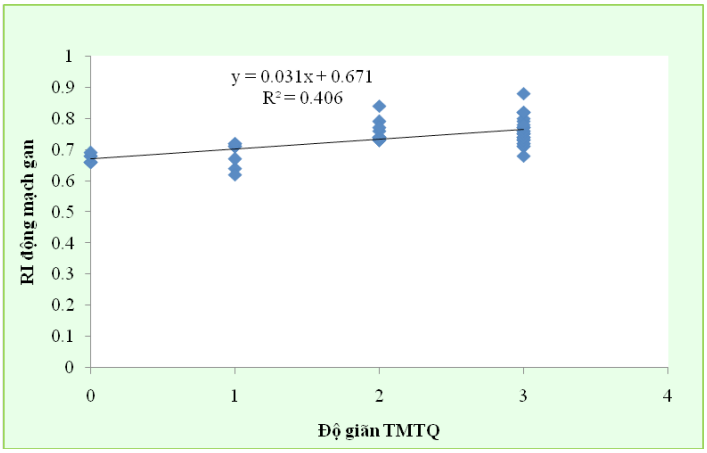


Chart 3. Relation between the hepatic artery index and the varices
Midle positive relation with $r_s = 0.61$; $p < 0.001$.

4. DISCUSSION

4.1. Portal vein speed

Our results showed the mean portal vein speed: 13.15 ± 2.30 cm/sec. Acording to Kieu Thi Phuong Nhan: 11.22 ± 2.68 cm/sec, and Shi Bao- Min: 12.00 ± 1.72 cm/sec; those are lower than of us, $p < 0.01$.

4. 2. Portal vein flow

In our study the mean portal vein flow: 609.12 ± 177.77 ml/sec. The result of Phan Van Trung: 403.97 ± 164.47 ml/min and lower than the controlled group: 565.04 ± 133.74, $p < 0.0001$. The result of Shi Bao- Min: 1078.00 ± 533.00 ml/min, lower than of controlled group: 1254.03 ± 410.00 ml/min, $p < 0,01$.

Our results are similar with the others and concordance to the theory.

4.3. Hepatic artery index

Our result showed the increasing of hepatic artery index: 78%, the mean hepatic artery:

0.74 ± 0.05, the min. 0.62, and the max: 0.88. That is similar to the others.

According to Duong Quang Huy: 53.4%, higher than of the controlled group: 0.68 ± 0.05, $p < 0.05$. The result of Agostino Colli: 87%, and of David Sacerdoti: 0.71 ± 0.07; higher than the controlled goup: 0.59 ± 0.04, $p < 0.001$.

5. CONCLUSION

By the mean of Doppler Ultrasound, 50 cirrhotic patients were enrolled in study from june, 2013 to june, 2014, we had the following conclusion:

In cirrhotic patients, the mean portal vein diameter: 1.35 ± 0.08 cm.

The mean portal vein speed: 13.15 ± 2.30 cm/sec.

The maximum portal vein speed: 18.24 ± 3.09 cm/sec, the minimum portal vein speed: 8.05 ± 1.75 cm/sec.

The portal vein flow: 609.12 ± 177.77 ml/min.

The hepatic artery index: 0.74 ± 0.05.

There was the negative middle relation between the portal vein flow and the severity of cirrhosis by Child - Pugh ($r = -0.59$; $p < 0.001$). - There was the positive relationship between portal vein flow and the degree of esophageal varix with $r_s = 0.34$; $p < 0.05$.

There was the Midle positive relation between the hepatic artery resistance index and the varices with $r_s = 0.61$; $p < 0.001$.

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