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Portal Hypertension Evaluation by Doppler Ultrasound

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Abstract: *In portal hypertension there is an increased hydrostatic pressure within the portal vein. Actual direct measurement of portal pressures is an invasive technique while Doppler ultrasound is a non-invasive, relatively cheap and easily acssessible imaging modality that helps in making the diagnosis of clinically significant portal hypertension. It also provides useful information as to it's cause and presence of complications. The present study was carried out to study the usefulness of PortoSplenicHepatic Doppler in Portal hypertension. 70 cases of clinically proven or suspected cases of portal hypertension were assessed with Doppler ultrasound. Retrospective review of the findings was done to assess the status of Portal vein, splenic vein and hepatic veins for calibre, presence or absence of blood flow, direction of flow, velocity and phascicity. Presence of portosystemic collaterals was looked for. Portal vein diameter was consistently enlarged in 67 (95%)cases. Flow velocities were found to be below 10 cm/sec in majority of the cases. Portosystemic collaterals were noted in 20 (30%) patients. Color Doppler ultrasound is a noninvasive diagnostic tool. It was found to provide important information on the heamodynamic alterations in porto-hepatic venous system in all the patients.*

Key Words: *Portal Hypertension, Doppler Ultrasound*

I. Introduction

In portal hypertension there is an increased hydrostatic pressure within the portal vein. An actual direct measurement of portal pressures is an invasive technique and obtained in only in a small minority of patients. Doppler ultrasound is a non-invasive, relatively cheap and easily acssessible imaging modality that helps in making the diagnosis of clinically significant portal hypertension. It also provides useful information as to it's cause and presence of complications. Present study was carried out by retrospectively reviewing the Doppler findings to evaluate its usefulness in patients of portal hypertension.

II. Methods

The present study was carried out in the department of Radiology, between March 2010 and April 2011. 7o Pateints of clinically proven or suspected Portal Hypertension, reffered from department of Gastroenterology , for Doppler examination, were examined using Philips HD 11 XE color Doppler system. Retrospective review of the findings was done to assess the status of Portal vein, splenic vein and hepatic veins for calibre, presence or absence of blood flow, direction of flow, velocity and phascicity. The portal vein diameter was measured with the patient supine, at a point where it crosses the IVC. Presence of portosystemic collaterals was looked for. Additional findings such as splenomegaly, ascites, pleural effusion and cholelithiasis were also recorded.

III. Results

There was equal distribution of cases among the male (35) and female(35) in our study. Majority of the patients were found to be in the age groups of 20-30 years followed by 40-50 years (Table 2). The Doppler findings of all the 70 patients with portal hypertension were assessed for parameters as shown in Table 1. Splenomegaly was most commonly associated finding followed by liver parenchymal disease and ascites (Table 3).

Table 1

PSH Doppler	No. of cases
Portal vein diameter> 13 mm	67
Portal vein flow velocity<10	62
Direction of flow: Hepatpetal Hepatofugal	 69 1
Portal vein cavernoma	30

Table 2

Age group (years)	No of cases
0-10	2
10-20	9
20-30	20
30-40	11
40-50	15
50-60	8
60-70	5

Portal vein thrombosis	10
Splenic vein diameter >10 mm	57
Splenic veinThrombosis	1
Hepatic vein Thrombosis (Budd-Chiari)	2

Table 3

Associated findings:	No. of cases
1) Liver parenchymal disease	36
2) Splenomegaly	
3) Ascitis	60
4) Pleural effusion	36
5) Cholelithiasis	6
	3

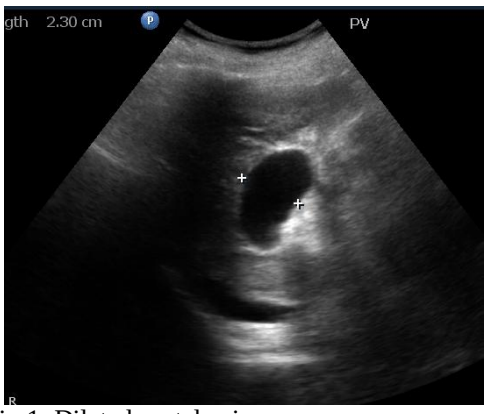


Fig 1: Dilated portal vein.

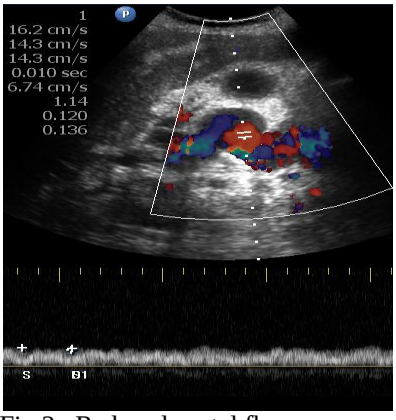


Fig 2 : Reduced portal flow.

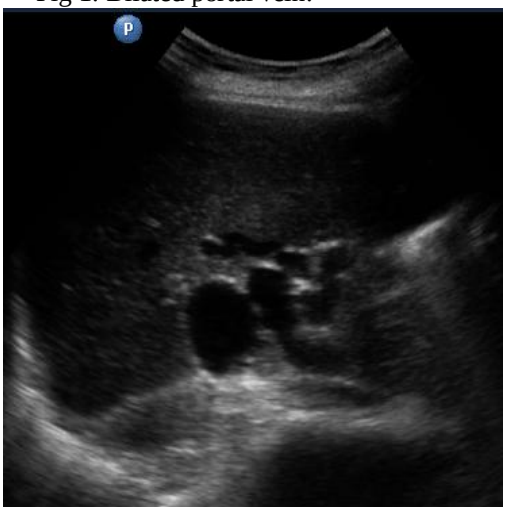


Fig 3: Portal vein cavernoma.

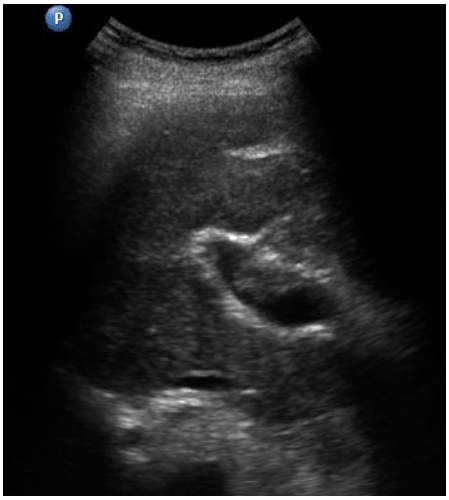


Fig 4: Portal vein thrombus.

IV. Discussion

Portal Vein: In portal hypertension, portal vein diameter (unless complicated by cavernoma or chronic thrombus) is increased. The diameter is measured with the patient supine, at a point where it crosses the IVC. Measurements greater than 13 mm indicate portal hypertension (fig 1). Usually the blood flow is hepatopetal(towards the liver) with velocity range of 15-18 cm/sec. On spectral Doppler it shows continous forward flow with respiratory phascicity. In portal hypertension the blood flow is typically reduced with velocities dropping to below 15 cm/sec (fig 2), loss of respiratory phascicity and in advanced cases reversed (hepatofugal) flow. Congestive index is the ratio of portal vein cross sectional area (cm2) to mean portal venous flow velocity (cm/sec). In normal subjects this ratio is approximately 0.07 and in portal hypertension it rises to above 0.1. Associated findings of portal vein cavernoma formation is suggestive of extrahepatic portal hypertension. It was seen in 30 patients in our study.

Portal vein thrombosis may also be seen due to slowing of the blood flow in the portal venous bed. It may be acute or chronic and complete or partial (fig 4).

Splenic vein: Enlargement of splenic vein (more than 10mm) is suggestive of portal hypertension (fig 5). Reversed flow may also be rarely seen in some cases.

Hepatic veins: The normal hepatic venous flow is antegrade and phasic. In portal hypertension the phascicity is decreased with spectral broadening. Hepatic venous thrombosis (Budd Chiary Syndrome) may be associated with portal vein thrombosis. Presence of porto-hepatic collaterals may be noted in such cases.

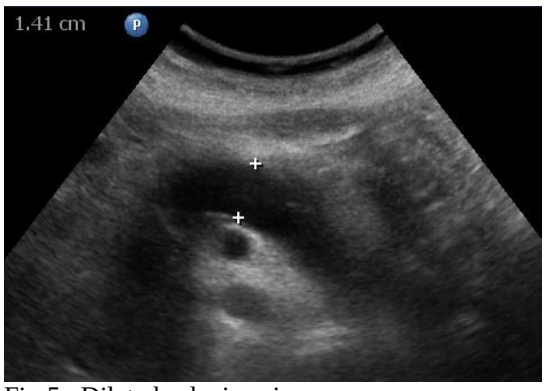


Fig 5 : Dilated splenic vein.

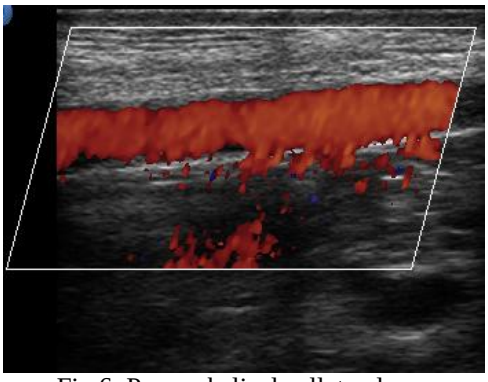


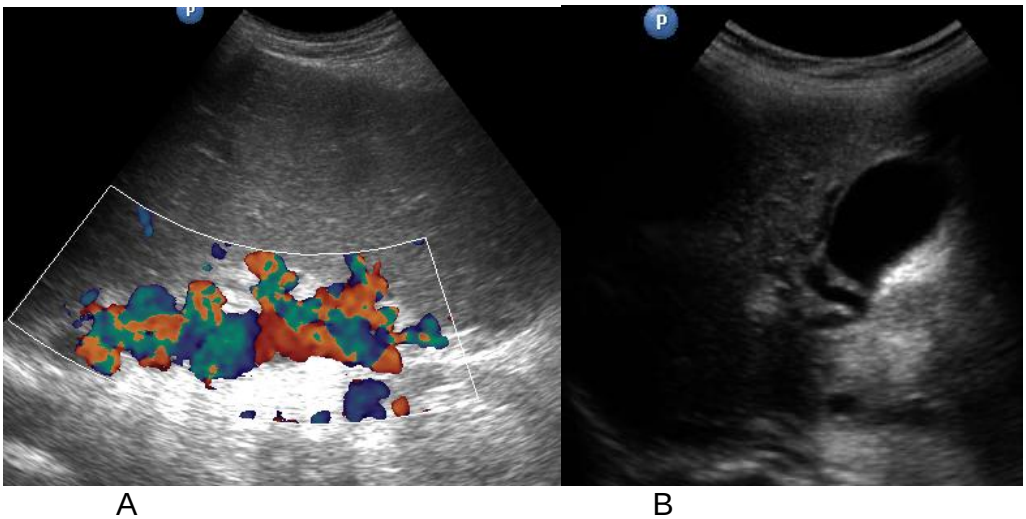
Fig 6: Paraumbelical collateral.

Portosystemic collaterals: Demonstration of portosystemic collaterals is diagnostic of Portal Hypertension. Portosystemic collaterals form when the resistance to blood flow in the portal vessels exceeds the resistance to flow in the small communicating channels between the portal and systemic circulations. Several major sites of portosystemic venous collaterals occur. Those commonly identified on Doppler ultrasound are:

Gastroesophageal or short gastric: They are best visualized through the left lobe of liver. They may lead to threatening haemorrhages. They are formed between the coronary (Left gastric vein) and the short gastric veins. Normal coronary vein is 4mm in diameter and shows hepatopetal flow . In portal hypertension it is enlarged and may show hepatofugal flow.

Paraumbelical: It originates from Left portal vein and connects to superior and inferior epigastric veins around umbilicus (fig 6). Hepatofugal venous flow in ligamentum teres with velocity of more than 5 cm/sec is suggestive of Portal Hypertension.

Splenorenal and gastrorenal: They are seen in the hilar region of spleen (fig 7 A) and left kidney representing collaterals between splenic , coronary , short gastric veins and the systemic renal and adrenal veins.



A B

Fig 7: A: Splenomegaly with hilar collaterals B: GB wall collaterals.

Gall Bladder: These are seen in GB wall (fig 7 B) and reflect shunting of blood from cystic vein to anterior abdominal wall.

Associated Findings: Mild to moderate splenomegaly , ascites , pleural effusion are often associated in patients of portal hypertension. In our study cholelithiasis was also seen in 3 cases.

V. Conclusion

Ultrasound is a well established noninvasive diagnostic modality for assessment of portal hypertension. Addition of color and spectral Doppler of porto splenic hepatic vessels reveals significant heamodynamic information and helps in precise evaluation of the vascular anatomy in Portal Hypertension.

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