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Radiodiagnosis

ROLE OF COLOUR DOPPLER ULTRASONOGRAPHY IN THE EVALUATION OF PORTAL VENOUS HYPERTENSION

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ABSTRACT

Introduction: Colour Doppler ultrasonography being non-invasive reliable and widely available tool, the present study intends to study the role of colour Doppler sonography in evaluation and diagnosis of portal hypertension.

Methods: Forty portal hypertensive patients were studied using colour Doppler ultrasonogram from ASRAM Medical College, Eluru. Gray scale and colour Doppler along with duplex Doppler was used to study flow metric changes collaterals and other findings.

Results: Majority of cases were in the age group 51-65 years with males being predominantly affected. Dilated portal vein was seen in 55% of cases. Hepatopetal, hepatofugal and bidirectional flow was seen in 60-85%, 7.5-10% and 2.5% of cases in different veins. 15-30% of veins showed thrombosis. Splenomegaly and ascites were seen in 87.5% and 77.5% respectively. Most frequent collaterals were gastrosplenic and splenorenal group. The most common cause of aetiology was cirrhosis.

Conclusion: Colour Doppler ultrasonography detects various findings like dilated portal vein, respiratory variation, flow direction, splenomegaly and ascites accurately. It helps also helps in identifying the aetiology.

KEYWORDS : Portal hypertension; Hepatofugal flow; portosystemic collaterals; colour Doppler ultrasound.

INTRODUCTION

Portal hypertension is the hemodynamic abnormality frequently associated with serious liver disease, although it is recognized less commonly in a variety of extrahepatic diseases also. Many of the most lethal complications of liver disease are directly related to the presence of portal hypertension including ascites, portalsystemic encephalopathy and haemorrhage from gastro oesophageal varices.[1]

Portal hypertension can be sinusoidal, pre sinusoidal and post sinusoidal,accurate diagnosis by imaging modality can help in prompt treatment.In majority of cases portal hypertension is seen as a major complication of cirrhosis. It can further lead to life threatening complications like variceal bleeding acute or chronic hepatic encephalopathy. So accurate diagnosis helps in timely implementation of surgical and medical management and thus prevents complication.

Ultrasonography with colour Doppler helps in evaluation of portal hypertension. It can permit differentiation of sinusoidal, pre or post sinusoidal cause of portal hypertension. It also allows to look for sequelae like portal vein thrombosis, oesophageal varices with reasonable accuracy.

Colour Doppler sonography is a non-invasive, cost-effective, require no radiation, it is most rapid, widely available and easy to follow up and presently the initial imaging of choice.

Hence purpose of study is to study the role of colour Doppler sonography in portal hypertension.

OBJECTIVES

1. To know the spectrum of colour Doppler sonographic findings in portal hypertension.
2. To study flow metric changes in portal hypertension.
3. To look for presence of various portosystemic collaterals.

METHODOLOGY

Study location:

The main source of data for the study are, patients from ASRAM Medical College, Eluru.

Study population:

All patients referred to the department of radio diagnosis with the clinically diagnosed cases of portal hypertension, in a period of 2 years from November 2017 to November 2019 were subjected for the study. 40 cases of portal hypertension were studied.

Study design: Cross sectional study

Inclusion Criteria:

All cases of age group between 20-65 years with clinical diagnosis of portal hypertension

Exclusion criteria:

Paediatric age group cases, pregnant cases and Traumatic cases were excluded.

Tools used:

All patients included in the study underwent ultrasonography of abdomen using a curvilinear and a sector probe of 3.5 - 5.0 MHZ coupled with colour Doppler equipment.

Philips Envisor CHD and **Philips HD11XE** ultrasound machines coupled with colour Doppler equipment were used for the study.

RESULTS

The most common age group presenting with portal hypertension was between 51-65 years (47.5%). Patients under 36-50 years age group were 37.5% and only 15% were in age group 20-35 years. Males were more predominantly affected than females. (Table 1)

Table 1: Distribution of study participants according to Age and Gender (N=40)

Variables	Categories	No.of cases	Percentage (%)
Age (years)	20 – 35	6	15
	36 – 50	15	37.5
	51-65	19	47.5
Gender	Female	9	22.5
	Male	31	77.5

Table 2 represents the distribution of study participants according to ultrasound findings.

- Diameter of portal vein of > 13mm was seen in 55% cases.
- Variation with respiration of portal vein was studied. 85% of cases showed less than 20% increase in diameter with deep inspiration. Only 15% cases had respiratory increased diameter greater than 20%.
- Splenomegaly > 13 cm was seen in 87.5% of individuals.
- Ascites is a frequent finding in portal hypertension. It is seen in 77.5% of cases.

- Thrombosis of vein was more common in portal vein seen in 30%. Splenic vein showed 22.5% of thrombosis. Thrombosis in SMV was less frequent than above two veins, corresponding to 15%.

Table 2: Distribution of study participants according to ultrasound findings (N=40)

Variables	Categories	No.of cases	Percentage
Portal vein diameter	<13 mm	18	45
	> 13 mm	22	55
Variation of portal vein diameter with respiration	>20%	6	15
	<20%	34	85
Splenomegaly	Present	35	87.5
	Absent	5	12.5
Ascites	Present	31	77.5
	Absent	9	22.5
Thrombosis	Portal vein	12	30
	Splenic vein	9	22.5
	Superior mesenteric vein	6	15

Table 3 represents the direction of flow in portal, splenic and superior mesenteric veins.

Portal vein: The flow direction in portal vein is predominantly hepatopetal in 24 patients corresponding to 60% of cases. However 25% patients showed no flow due to complete thrombosed vein. Partially thrombosed / recanalised veins showed peripheral petal flow.

Splenic vein: 75% cases showed flow direction towards liver i.e. hepatopetal, 3 cases (7.5%) showed complete hepatofugal flow, whereas 1 case (2.5%) showed to and fro bidirectional flow. However 6 cases (15%) showed no flow due to complete thrombosed vein. Partially thrombosed / recanalised veins showed peripheral petal flow.

Superior Mesenteric Vein: In SMV most frequent flow pattern was hepatopetal corresponding to 85%.Bidirectional and hepatofugal flow were detected in one case each. They correspond to 2.5% each. 4 cases (10%) showed no flow.

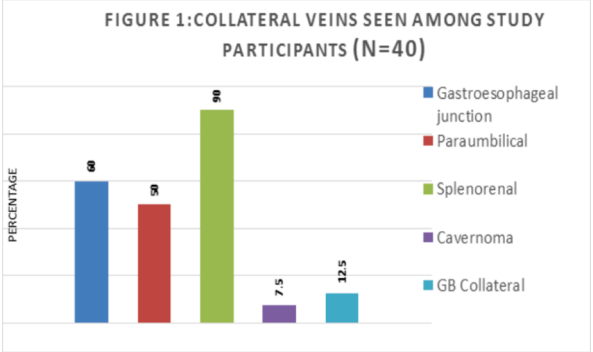
Table 3: Distribution of study participants according to flow metric patterns in veins (N=40)

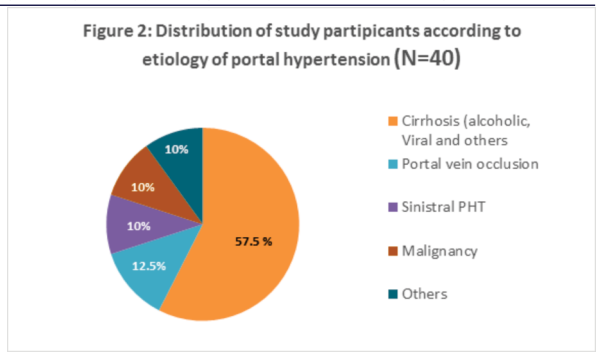
Direction Of Flow	Portal Vein	Splenic Vein	Superior Mesenteric Vein
Petal	24 (60)	30 (75)	34 (85)
To and fro	1 (2.5)	1(2.5)	1 (2.5)
Fugal	5 (12.5)	3 (7.5)	1 (2.5)
No flow	10 (25)	6 (15)	4 (10)

* ***Note: Numbers within brackets indicate percentages***

Most frequent collateral were seen in splenorenal and gastro renal group in 90% cases. Coronary vein and GEJ collaterals corresponded to 60% and Paraumbilical vein was seen in 50% cases. Gallbladder varices noted in 12.5%. Least frequent was cavernoma seen in 7.5% cases. (Fig.1)

In our study, most common aetiology was cirrhosis seen in 23 cases (57.5%).Portal vein occlusion of benign aetiology was seen in 12.5% cases. Sinistral portal hypertension, malignancy causing venous occlusion were seen in 10% cases each. Other rare causes seen in 10% cases. (Fig 2)





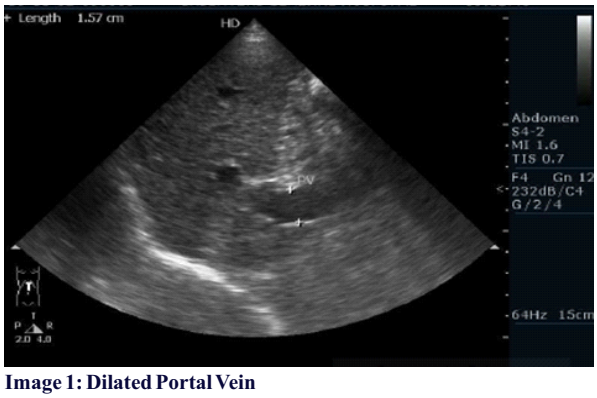


Image 1: Dilated Portal Vein

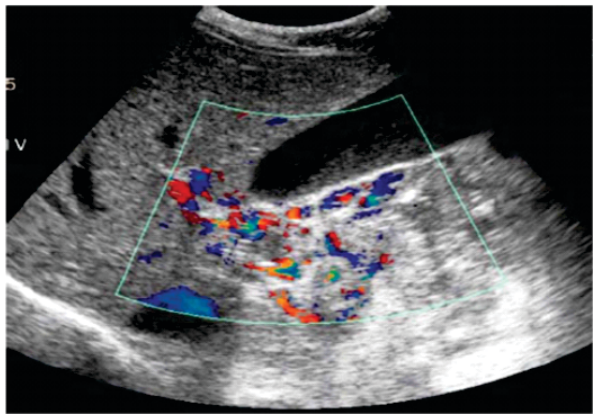


Image 2: Thrombosed portal vein with cavernoma formation

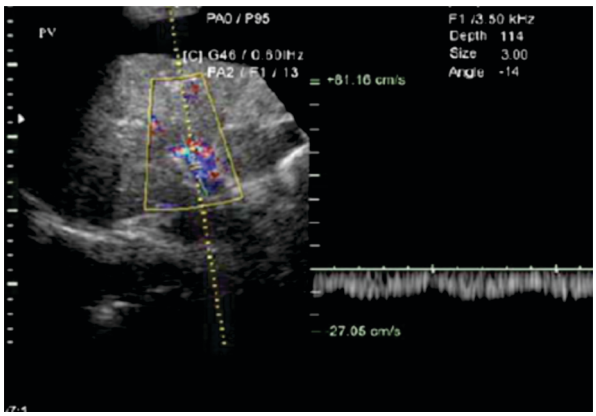


Image 3: Hepatofugal flow in portal vein

DISCUSSION

Portal hypertension is one of serious and debilitating condition. It results from various causes, but cirrhosis being most frequent of all. It leads to various haemodynamic alterations in body especially abdomen. Colour Doppler ultrasonography being non-invasive reliable and widely available, is initial tool for evaluation and diagnosis of portal hypertension, finding out etiology and looking for its complications.

We studied 40 patients, who were clinically diagnosed as portal hypertensive and confirmed on ultrasound and Doppler study.

Age and sex distribution

Majority of cases were in the age group of 51-65 years i.e. 47.5%. Next frequency was 37.5% in 36-50 years age. Males were affected more than females, 77.5% males as against 22.5% females. This may be due to the higher incidence of alcohol consumption leading to cirrhosis and portal hypertension.

Portal vein diameter

In the present study portal vein diameter above 13mm was seen in 55% of cases. Similar findings were found in studies done in southwest Ethiopia and Newyork that portal vein diameter >13 mm can be considered fairly characteristic sign of portal hypertension.[2,3]

A study done by Ditchfield et al.[4] found that portal vein diameter of 13mm was seen in 42% and >13mm in 59% of patients diagnosed as portal hypertension using endoscopy, sonography and Doppler signs. Demosthenes D et al are of the opinion that the portal vein diameter >13mm is indicative of portal hypertension with specificity of 100% and sensitivity of 45-50%.[5]

Diameter of <13mm was probably due to, development of portosystemic collateral decompressing portal venous pressure; and cases where portal vein was chronically thrombosed.

Flow direction

Ditchfield et al studied 118 cases of portal hypertension diagnosed using specific endoscopic sonographic and Doppler signs. They found that reversed flow in portal vein was seen in 3.4 – 5.3% cases.[4]Another study done by Alexandra von et al found direction of portal vein flow was normal in 73%, hepatofugal in 9% and bidirectional in 6% patients.[6]

Burcharth F et al[7] found that 14.8% of patients had total hepatofugal blood flow which is similar to our findings. In the present study, the direction of flow in portal vein is hepatopetal in 60%, bidirectional in 2.5% and hepatofugal in 12.5%.

The discrepancies with first two studies may be due to differences in the proportion of patients with advanced disease and limited sample size.

Variation in vein diameter with respiration

According to study conducted by Bolondi et al an increase of <20% in diameter of portal vein with deep inspiration indicates portal hypertension with sensitivity of 80% and specificity of 100%.[8] RokniYazeli et al found that reduced respiratory changes in diameter ≤ 20% for portal vein had higher sensitivity of 89% and specificity of 89%.[9]In our study we had 85% of cases which showed diameter change of < 20%. Our study correlates with above studies.

Splenomegaly

Among portal hypertension patients, Gibson et al found that sonographically 52% of patients had large spleen, 35% with spleen <1 standard deviation from normal and 13% with equivocal splenomegaly. They concluded that splenomegaly is an intensive sign of portal hypertension.[10]

According to Demosthenes et al, mild to moderate splenomegaly (> 13cm) is a common finding in portal hypertension.[5] In our study we had 87.5% of cases showing splenomegaly and 12.5% did not show enlarged spleen.

Collaterals

Kadir et al studied diagnostic value of real time sonography for portal hypertension in 38 patients. The frequency of detection of collaterals compared to percutaneous transhepatic portography, sonography was 85% for coronary (GEJ),100% for paraumibilical and 10% for short gastric vein.[11]

Chawla et al studied one hundred and two patients with different forms of portal hypertension and found that frequency of gallbladder varices was between 13-24% in different forms of portal hypertension.[12]

Subrananyam et al studied 40 cases with portal hypertension and collateral, were seen in 88% of cases and GEJ collateral, seen in 64% cases.[13]

In our study various collateral, were seen GEJ (gastroesophageal varices and coronary vein) collateral seen in 60% cases, paraumbilical vein in 50%. The most frequent type of collaterals were SR (splenorenal and gastro renal) seen in 90% cases. Cavernoma formation was seen in 7.5% cases and 12.5% cases showing gall bladder varices.

Most of findings of our study correlate well with other studies. The increased frequency of splenorenal and gastrorenal may be due to their easier detection because of their location or small GEJ collaterals which were not detected or due to more number of cases with portal vein thrombosis and sinistral portal hypertension.77.5% of cases were having ascites.

Etiology

In our study the most frequent etiology was cirrhosis, which was seen in 57.5% cases. It included alcoholic, viral and other forms of cirrhosis. Next frequent cause was portal vein occlusion (12.5%). Malignancies like HCC and pancreatic carcinoma are noted causing thrombosis of portal vein, SMV and SPLV in 10% of cases. Similar findings were found in a study done in Mysore with most common etiology for portal hypertension being cirrhosis (76.2%). Portal vein occlusion was seen in 19% of cases.[14]

REFERENCES

1. De Franchis R, Primignani M. Endoscopic treatments for portal hypertension. InSeminars in liver disease. 1999;19(04):439-55.
2. Geleto G, Getnet W, Tewelde T. Mean normal portal vein diameter using sonography among clients coming to radiology department of Jimma University Hospital, Southwest Ethiopia. Ethiopian journal of health sciences. 2016;26(3):237-42.
3. Weinreb J, Kumari S, Phillips G, Pochaczevsky R. Portal vein measurements by real-timesonography. AJR.1982 Sept;139:497-499.
4. Ditchfield MR, Gibson RN, Donald JD, Gibson PR. Duplex Doppler Ultrasoundsign of portal hypertension. Relative diagnostic value of examination ofparaumbilical vein, portal vein and spleen. Australian Radiology 2007.2008March;36(2):102-105.
5. Cokkinos DD, Dourakis SP. Ultrasonographic assessment of cirrhosis and portal hypertension. Current Med Imaging Rev 2009;5:62-70.
6. Herbay Av, Frieling T, Haussinger D. Color Doppler sonographic evaluation ofspontaneous portosystemic shunts and invesion of portal venous. JCU 2000Sep.;28(7):332-339.
7. Burcharth F, Aagaard J. Total hepatofugal portal blood flow in cirrhosis demonstrated bytranshepaticportography. Rofo 1988 Jan.;148(1):47-9.
8. Bolondi L, Gandolfi L, Berger LA. Ultrasonography in assessment of portal venous system. The Lancet. 1978 Mar 25;311(8065):656-7.
9. Yazdi HR, Khalilian MR. Sonograhic assessment of respiratory variations in diameter ofportal and splenic veins in cirrhotic patients and healthy controls. Iran J Radiol 2005June;2(3,4):95-98.
10. Gibson PR, Gibson RN, Ditchfield MR, Donlan JD. Splenomegaly-an insensitive sign ofportal hypertension. Aust NZ J Med 1990 Dec.;20(6):771-4.
11. Dokmeci AK, Kimura K, Matsutani S, Ohto M, Ono T, Tsuchiya Y, et al. Collateralveins in portal hypertension : Demonstration by sonography. AJR 1981Dec.;137:1173-1177.
12. Chawla A, Dewan R, Sarin SK. The frequency and influence of gall bladder varices ongall bladder functions in patients with portal hypertension. Am J Gastroenterol1995;90:2010-2014.
13. Subramanyam BR, Balthazar EJ, Madamba MR, Raghavendra BN, Horii SC, Lefleur RS. Sonography of portosystemic venous collaterals in portal hypertension. Radiol 1983;146:161-166.
14. Chakenahalli N, Lingaiah RN, Varun SM. Role of Ultrasound Doppler in Evaluation of Portal Hypertension. International Journal of Anatomy, Radiology and Surgery. 2018;7(1).