



APPLICATION OF COLOR DOPPLER ULTRASONOGRAPHY IN EVALUATION OF PORTAL HYPERTENSION: A HOSPITAL BASED PROSPECTIVE STUDY

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ABSTRACT

Portal hypertension is one of the common liver disorders. If it is not evaluated early can leads to various complications. The present study aimed to evaluate the role of color Doppler in the diagnosis of portal hypertension. This study was conducted in the Department of Radiodiagnosis, Kannur Medical College, Kannur, Kerala during the period of six months. Patients were selected on the basis of clinical complications. A total of 40 patients were included in the study. All the patients were explained study procedure in detailed and inform consent was obtained. All the patients were subjected to color Doppler for the evaluation of portal hypertension. Maximum number of patients had age between 51-60 years. Males were more than females. Most patients showed coarse liver with presence of ascites. Maximum patients showed petal type of blood flow. 34 patients showed damping index less than <0.6 . The present study results showed the significant changes in the lumen, blood flow and diameter of portal veins. Early diagnosis of portal hypertension plays major role in the prevention of mortality. From the study results it is concluded that color Doppler plays major in the diagnosis of portal hypertension.

KEYWORDS : Liver, hypertension, color Doppler, portal hypertension, hepatic, cirrhosis.

INTRODUCTION

Portal hypertension syndrome is a common evaluative complication of several hepatic and extrahepatic diseases, liver cirrhosis responsible for more than 80% of cases. When diagnosed it has prognostic value because of the high incidence of hemorrhagic, metabolic and infectious complications that these patients may develop¹ so clinical suspicion must be confirmed by objective complementary studies that provide information about the etiology and severity of the disease there by helps in timely implementation of surgical and medical management and thus prevents complication. Portal hypertension can be classified as intrahepatic, extrahepatic and hyperdynamic,² accurate diagnosis by imaging modality can help in prompt treatment so Ultrasound (US) is the first imaging examination used for assessing the hepatic parenchyma and vasculature in patients with portal hypertension.³ Ultrasonography with colour Doppler helps in evaluation of portal hypertension. It can permit differentiation of sinusoidal, pre or post sinusoidal cause of portal hypertension and can provide a great deal of information about the morphology and hemodynamics of portal hypertension. It also allows looking for sequelae like portal vein thrombosis, oesophageal varices with reasonable accuracy. Sonography, in addition of being nonionizing, its accessibility, noninvasiveness, portable nature, reliable, low cost and also its ability of rapidly accomplishment,⁴ makes it a good diagnostic tool which plays a great role in the diagnosis and follow up of patients with portal hypertension. Hence purpose of my study is to evaluate role of Duplex Ultrasonography in portal hypertension.

MATERIALS AND METHODS

Study settings and period

The study was conducted in the Department of Radiodiagnosis, Kannur Medical College, Kerala. The study period was six months, starting from January 2018.

Inclusion criteria

- All cases with clinical suspicion of portal hypertension.

Exclusion Criteria

- Patients who underwent hepatobiliary surgery or recent surgery for any other reasons.
- Obese Patients.
- Trauma and Pregnant patients.

Procedure

This is a cross sectional study. All patients referred to the department of Radiodiagnosis with the clinically suspected cases of portal hypertension. A total of 40 patients were included in the study. After taking Informed consent, all patients included in the study will undergo 2D grey scale real time ultrasonography of abdomen using a curvilinear probe of 3.5 – 5.0 MHZ coupled with colour Doppler equipment, in GE LOGIC S8 ultrasound machine, and morphology and haemodynamic parameters of portal hypertension are assessed.

Statistical analysis: The data was expressed in number and percentage. Microsoft excel 2006 was used for analysis.

RESULTS

Maximum number of patients with age between 51-60 years. Least number was seen with age 30-40 years (Graph-1). Males (n=38) were compared to females (n=2) (Graph-2). 36 patients showed coarse in liver. 31 patients with ascities. 31 patients showed Grade-0 encephalopathy. 27 had petal type of portal vein flow (Table-1). 34 had normal and 6 showed abnormal lumen of splenic vein. 12 has class-B child pugh score (Table-2).

DISCUSSION

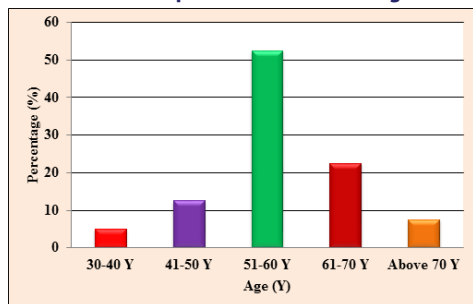
Portal hypertension is a frequent development in the cirrhotic setting. It results from resistance to portal blood flow and can lead to complications such as variceal bleeding and ascites. Portal hypertension is one of the major cause of severe complications and death in cirrhotic patients. The aim is to diagnose and characterize the severity of portal hypertension to minimize potentially severe and deadly complications. Doppler ultrasonography allows the non-invasive investigation of hepatic and portal hemodynamics. Thus, many attempts to assess portal hypertension by Doppler ultrasonography have been made in patients with cirrhosis.⁵ The evaluation of hepatic vein (HV) waveform change by Doppler ultrasonography could be valuable for assessing portal hypertension in cirrhotic patients.^{6,7} Doppler HV waveform in healthy humans is normally triphasic (two negative waves and one positive wave) as a consequence of cardiac variations in central venous pressure.^{8,9} It is known that the normal triphasic HV Doppler waveform is transformed into a biphasic or monophasic waveform in cirrhosis and portal hypertension. Assessing the damping index (DI) allows quantification of the abnormal HV waveform extent (loss of pulsatility).¹⁰

Hence the present study was planned to evaluate the spectrum of color Doppler sonographic findings in portal hypertension. In the present study males outnumbered females that is, 95% of the patients were males and 5% were females with male to female ratio as high as 12:1. Recently a similar retrospective study by Kim MY et.al¹¹ from Korea to assess whether the waveform change during respiration on hepatic vein Doppler sonography is a parameter of severe portal hypertension as estimated by the hepatic venous pressure gradient (HVPG) and to compare with a hepatic vein damping index (DI) at expiration also reported 77.3% in males and 22.7% females. Liver disease demonstrates a sex predilection, with males making up more than 60% of patients with chronic liver disease and cirrhosis.¹² However, higher incidence among males could be attributed to the alcohol consumption leading to cirrhosis and portal hypertension. In this study more than half of the study population (52.5%) presented with age from 46 to 60 years. The next common age group was 31 to 45 years noted in 35% of the patients. The mean age was noted as 45.45 ± 10.59 years. These findings were consistent with a study to assess the etiological reasons for portal hypertension in adult patients attending a tertiary care center in southern India which reported mean age as 46 years.¹³ Another study by Kim MY et al⁶⁸ from Korea also reported mean age of 52.8 years. A study by Bolondi et.al¹⁴ had concluded that portal vein diameter > 13 mm can be considered fairly characteristic sign of portal hypertension. The same was true in this study with almost 50% of the patients having portal vein diameter of ≥ 13 mm. In our study the lumen appeared normal and anechoic in 75% of the patients and the flow was petal in 67.5% of the patients while 5% of the patients showed hepatofugal flow. Herbay Av et.al¹⁵ studied 67 men and 49 women with biopsy proven cirrhosis and showed that the direction of venous flow was hepatopetal in 73%, hepatofugal in 9% and bidirectional in 6%, whereas 11% of patients had thrombosed portal vein. Another study by Ditchfield et.al¹⁶ wherein they studied 118 proven patients of liver cirrhosis and demonstrated the hepatofugal blood flow in the portal vein in 3.4 to 5.3% of patients. Therefore, this finding correlates well with other studies. This non-invasive method is useful for the early diagnosis of portal hypertension.

CONCLUSION

The study results conclude that color ultrasound sonography have wide application in the diagnosis of portal venous hypertension. Early diagnosis and initiation treatment can prevent the mortality and morbidity.

Graph-1: Distribution of patients based on the age



Graph-2: Distribution of patients based on the gender

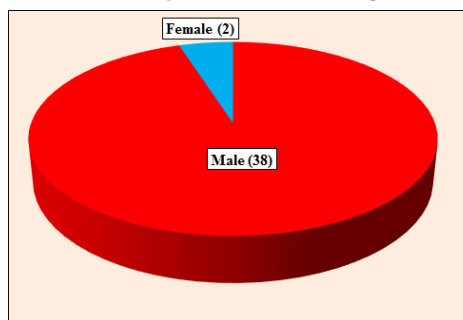


Table-1: Distribution of patients based on color Doppler evaluation portal vein

Observation	Number	Percentage (%)
Liver echotexture		
Increased	4	10.00
Coarse	36	90.00
Ascites		
Present	31	77.50
Absent	9	22.50
Grade of encephalopathy		
Grade I	9	22.50
Grade 0	31	77.50
Portal vein flow		
Fugal	1	2.50
Petal	27	67.50
To&Fro	1	2.50
No flow	11	27.50
Lumen of portal vein		
Normal	30	75.00
Abnormal	10	25.00

Table-2: Distribution of patients based on color Doppler evaluation of splenic vein

Observation	Number	Percentage (%)
Lumen of splenic vein		
Normal	34	85.00
Abnormal	6	15.00
Splenic vein flow		
Fugal	0	
Petal	34	85.00
To&Fro	1	2.50
No flow	5	12.50
Child-Pugh score		
Class A	5	12.50
Class B	12	30.00
Class C	23	57.50

REFERENCES

- Fernandez Perez FJ, García Montes JM, Castro Laria L, Martin Guerrero JM, Jimenez Saenz M, Herrerias Gutierrez JM. Usefulness of ultrasonography in the diagnosis of portal hypertension. *RevEspEnferm Dig.* 1998 Nov;90(11):806-812.
- Pellerito JS, Polak JF. Ultrasound Assessment of the hepatic vasculature. In: Introduction to vascular ultrasonography, 6th ed. Elsevier Inc; 2012. p.495-515.
- Demosthenes D, Cokkinos, Spyridon P. Dourakis. Ultrasonographic Assessment of Cirrhosis and Portal Hypertension. In: Current Medical Imaging Reviews, 2009, 5, 62-70.
- Meire EB, Dewbury KC, Cosgrove DO. Abdominal and General Ultrasound. Churchill Livingstone. Edinburgh, 1993: 1:311.
- Goyal AK, Pokharna DS, Sharma SK: Ultrasonic measurements of portal vasculature in diagnosis of portal hypertension. A controversial subject reviewed. *J Ultrasound Med* 1990. Jan;9(1):45-48.
- Iwao T, Toyomaga A, Oho K, Tayama C, Masumoto H, Sakari T, Sato M, Tanikawa K. Value of Doppler ultrasound parameters of portal vein and hepatic artery in the Diagnosis of cirrhosis and portal hypertension in: *Am J Gastroenterol.* 1997 Jun; 92(6):1012-1017.
- Zironi G, Gaiani S, Fenyves D, Rigamonti A, Bolondi Z, Barbara L: Value of measurement of mean portal flow velocity by Doppler flowmetry in the diagnosis of portal hypertension in: *J Hepatol.* 1992 Nov;16(3):298-303.
- Haag K, Rossle M, Ochs A, Huber M, Siegerstetter V, Olschewski M, et al. Correlation of duplex sonography findings and portal pressure in 375 patients with portal hypertension. *AJR Am J Roentgenol* 1999;172:631-635.
- Wachsberg RH, Obolovich AT. Blood flow characteristics of vessels in the ligamentum teres fissure at color Doppler sonography: findings in healthy volunteers and in patients with portal hypertension. *AJR Am Roentgenol* 1995; 164: 1403-1405.
- Kedar RP, Merchant SA, Malde HH, Patel VH. Multiple reflective channels in the spleen: A sonographic sign of portal hypertension. *Abdomen imaging* 1994;19:453-458.
- Kim MY, Baik SK, Park DH, Lim DW, Kim JW, Kim HS, et al. Damping index of Doppler hepatic vein waveform to assess the severity of portal hypertension and response to propranolol in liver cirrhosis: a prospective nonrandomized study. *Liver Int* 2007;27(8):1103-10.
- Kim WR, Brown RS, Terrault NA, El-Serag H. Burden of liver disease in the United States: Summary of a workshop. *Hepatology* 2002;36(1):227-42.
- Goel A, Madhu K, Zachariah U, Sajith KG, Ramachandran J, Ramakrishna B, et al. A study of aetiology of portal hypertension in adults (including the elderly) at a tertiary centre in southern India. *Indian J Med Res* 2013;137:922-7
- Bolondi L, Mazzotti A, Arienti V. Ultrasonographic study of portal venous system in portal hypertension and after portosystemic shunt operations. *Surg* 1984;95:261.
- Herbay Av, Frieling T, Haussinger D. Color Doppler sonographic evaluation of spontaneous portosystemic shunts and invasion of portal venous. *JCU* 2000;28(7):332-9.
- Ditchfield MR, Gibson RN, Donald JD, Gibson PR. Duplex Doppler Ultrasound sign of portal hypertension. Relative diagnostic value of examination of paraumbilical vein, portal vein and spleen. *Australasian Radiology* 2008;36(2):102-5.