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Role of Colour Doppler Ultrasonography in the Evaluation of Portal Venous Hypertension

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ABSTRACT
Introduction*: Ultrasound doppler is an accurate noninvasive investigation to assess the etiology, grading and complications of portal hypertension. The various spectrum of findings, flow volumetric changes and portosystemic collaterals can be assessed on ultrasonography.*
Aim*: The goals of our review were to assess the utility of Doppler ultrasonographic findings in portal hypertension and to assess different complications.*
Materials and methods: *A total of 40 patients referred to the Department of Radiodiagnosis, B J Medical college with clinically suspected or diagnosed with portal hypertension in a period from January 2021 to July 2021 were included in the study. The patients were studied using color doppler and were statistically analyzed..*
Results*: The mean age of patients was 49.3 years. There were 48 males and 15 females in this study. The most common etiology for portal hypertension was cirrhosis (76.2%). Splenomegaly was noted in 79.4% cases and ascites in 87.3%. Portal vein was dilated in 67.2% cases. Hepatopetal flow was noted in majority (77.8%) of the cases. Loss of respiratory phasicity of portal vein was noted in 87.9% cases. Decreased portal vein velocity was noted in 38.1% cases. Collaterals were noted in 63% of the cases, most common being the splenorenal collaterals which were seen in 49.2% of cases*
Conclusion*: Ultrasound Doppler is an accurate noninvasive investigation of assessing the aetiology, severity and complications of portal hypertension. The various spectrum of findings, flow metric changes and portosystemic collaterals can be accurately studied using ultrasound Doppler*
KEYWORDS: *Color Doppler, Hypertension*

I. INTRODUCTION

Portal hypertension is defined as by the pathologic increase in portal pressure in which the pressure gradient between the portal vein and inferior venacava (the portal pressure gradient (PPG) is increased above the upper normal limit of 5mm Hg). It can also be defined as surgically measured portal venous pressure of greater than 30 cm water. Portal hypertension can be sinusoidal, pre sinusoidal and post sinusoidal, exact analysis by imaging methodology can help in brief treatment, cirrhosis being the most common cause. It leads to various complications including hematemesis. Study of portal hypertension using color doppler holds its importance by aiding in the diagnosis of etiology, the severity and possible complications and to decide therapeutic measures. As direct measurement of portal vein pressure is an invasive procedure and may be associated with multiple complications. Ultrasound Doppler is a non-invasive, highly reproducible and cost-effective method for the evaluation of portal hemodynamics.

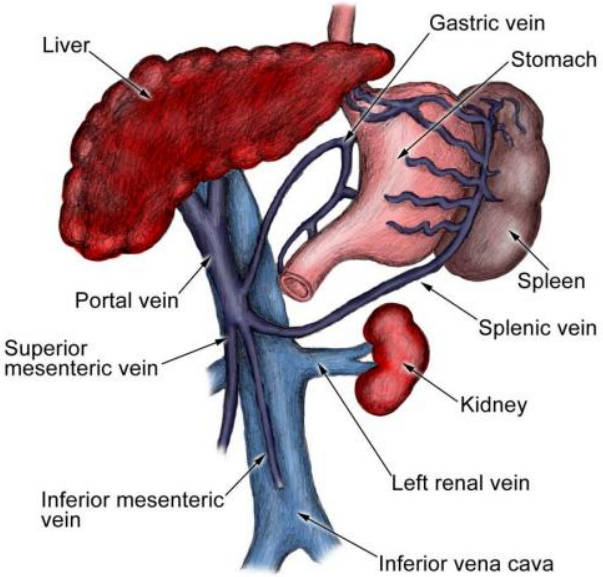

Fig. 1 : Anatomy of portal venous system

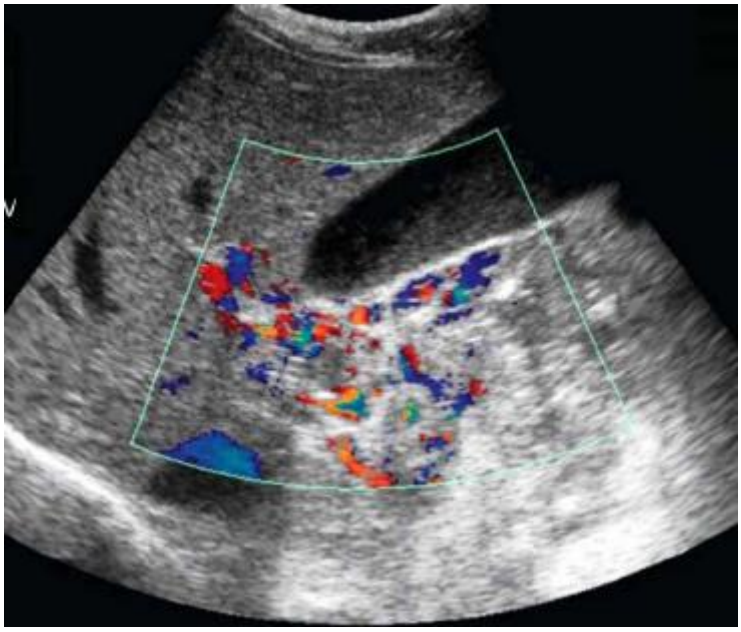

Fig. 2 : Thrombosed portal vein with cavernoma formation

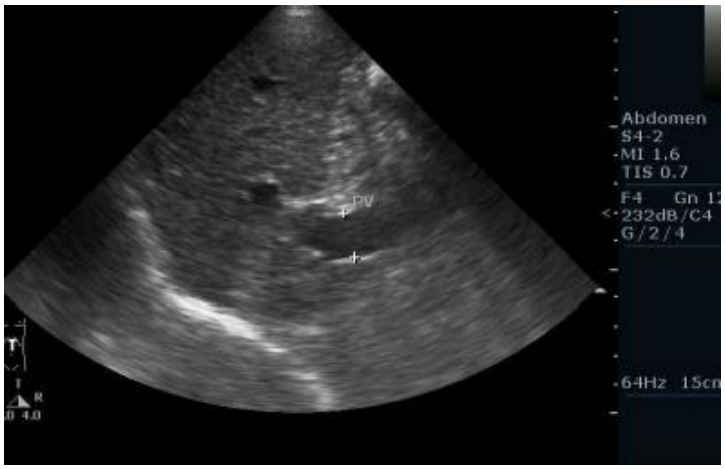

Fig.3 :Dilated portal vein

II. OBJECTIVES

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

III. MATERIALS AND METHODOLOGY

Study location:
This present descriptive study was conducted in the Department of Radiodiagnosis,B J Medical college, Pune.
Study population:
All patients referred to the department of radiodiagnosis with the clinical diagnosis of portal hypertension, in a period of 6 months from July 2021 to December 2021 were included for the review. 40 instances of portal hypertension were examined.
Study design: Cross sectional study

Inclusion Criteria:

- All cases with clinical diagnosis of portal hypertension
- Adult cases (cases in the age group of 20-65).

Exclusion criteria:

- Pediatric age group cases.
- Pregnant cases.
- Traumatic cases.

Tools used:
All patients remembered for the review went through ultrasonography of mid-region utilizing a curvilinear and an area test of 3.5 - 5.0 MH2 combined with shading Doppler hardware.
Philips HdxTultrasound machines coupled with color doppler equipment were used for the study.
Statistical test used: Statistical analysis was done using percentage and proportions.

IV. RESULTS:

Total of 40 patients were evaluated. The age group ranged from 20 to 65 years with most common age group was between 51-65 years (47.5%) [Table 1]. There were 31 males and 9 females in this study with male to female ratio of 3.45: 1 [Table 2]. Portal vein was dilated in 27 patients included in the study. In cases with intraluminal thrombosis the distance between the echogenic walls of portal vein was measured. Splenomegaly was noted in 32 patients among 40 included in the study[Table 4]. Ascites was found in 35 patients included in the study[Table 5]. The chi square value of 6.897 at probability value of 0.009 showed nonsignificant statistical association between dilated portal vein and portal hypertension. There was significant association of portal hypertension with splenomegalyand ascites (each $p<0.001$). Decreased velocity (<15 cm/sec) was noted in 15 cases, 19 cases had velocity >15 cm/sec. there were wide range of velocities from 8 to 41 cm/sec with a mean of 18 cm/sec. In present study, most common aetiology was cirrhosis seen in 30 cases (75%). Portal vein occlusion as the aetiology was seen in 20% cases. Malignancy causing portal venous occlusion was seen in 2.5% cases[Table 6].

TABLE 1 : AGE DISTRIBUTION

Age (years)	*No. of cases*	*Percentage*
20 – 35	*6*	*15*
36 – 50	*15*	*37.5*
51-65	*19*	*47.5*

TABLE 2: SEX DISTRIBUTION		
Sex	***No. of cases***	***Percentage***
Female	*9*	*22.5*
Male	*31*	*77.5*

Table 3: Diameter of portal vein				
Diameter of portal vein	Frequency	Percentage(%)	Chi square	p-value
<13 mm	13	32.5	6.8	0.009
>13 mm	27	67.5		
Total	40	100		

Table 4: Splenomegaly				
Span	Frequency	Percentage(%)	Chi square	p-value
<12.5 cm	8	20	21.7	<0.001
>12.5 cm	32	80		
Total	40	100		

Table 5: Ascites				
Ascites	Frequency	Percentage(%)	Chi square	p-value
No	5	12.5	35.063	<0.001
Yes	35	87.5		
Total	40	100		

Table 6: Etiology		
	Frequency	Percentage(%)
Cirrhosis	30	75%
Portal vein occlusion	8	20%
Malignancy	1	2.5%
others	1	2.5%
Total	40	100

V. **DISCUSSION**:

Portal hypertension is one of the serious and debilitating condition. It results from various causes, but cirrhosis being the most frequent of all. It leads to various hemodynamic alterations in body especially abdomen.

Colo doppler ultrasonography being non invasive reliable and widely available, is initial tool for evaluation and diagnosis of portal hypertension, finding the etiology and looking for the complications.

In our study, we studied 40 patients who were clinically diagnoses as portal hypertension and confirmed on ultrasonography. Various findings, their percentage of detection were studied. In our study,Portal vein diameter above 13 mm was seen in 67.5 % of cases, 80 % of cases had splenomegaly, 87.5% of cases had ascites. Cirrhosis was the most common etiology(75%) according to our study.

VI. CONCLUSION

Ultrasound Doppler is an accurate non-invasive investigation of assessing the aetiology, severity and complications of portal hypertension. The various spectrum of findings, flowmetric changes and portosystemic collaterals can be accurately studied using ultrasound Doppler.

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