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Corresponding Author
Kamal Agarwal,
Radio-diagnosis, National Institute of Medical Sciences and Research, Jaipur

Author Designation
[1,2]Assistant Professor

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Assessment of Ultrasound Guided Investigation in Patients with Portal Hypertension

[1]Preeti Agarwal and [2]Kamal Agarwal
[1,2]Radio-diagnosis, National Institute of Medical Sciences and Research, Jaipur

ABSTRACT
Cirrhosis is the most frequent reason for portal hypertension. In cirrhosis, the higher resistance is mostly due to changes in the structure of the liver (fibrosis and regenerating nodules). However, around one-third of the increased resistance is caused by the narrowing of blood vessels inside the liver, which can be treated with medications that widen the blood vessels. A record was created and all the patient's demographic and clinical information was documented. Ultrasound was performed on all patients by trained and experienced radiologists. All patients underwent standard blood tests. A record was created and all the patient's demographic and clinical information was documented. Ultrasound was performed on all patients by trained and experienced radiologists. All patients underwent standard blood tests. The authors determine that ultrasound is a useful diagnostic method in patients with portal hypertension to evaluate the extent of the condition. Nevertheless, additional research is advised.

INTRODUCTION

The mesenteric vein gathers blood from the splanchnic circulation. Therefore, the amount of blood flowing into the portal vein is influenced by the degree of constriction or dilation of the arterioles in the splanchnic region. The first step in the development of portal hypertension is an increase in vascular resistance that can happen at any point within the portal venous system. Portal hypertension is thus categorised as prehepatic (portal or splenic vein thrombosis), intrahepatic (cirrhosis) and post-hepatic (Budd-Chiari syndrome)[1-3]. Cirrhosis is the most frequent reason for portal hypertension. In cases of cirrhosis, the heightened resistance is mostly due to changes in the structure of the liver (fibrosis and regenerating nodules). However, approximately one-third of the heightened resistance is caused by the narrowing of blood vessels within the liver, which can be treated with vasodilators. This is due to the activation of stellate cells that contract myofibroblasts and vascular smooth muscle cells in portal venules. This activation is triggered by an increase in endogenous vasoconstrictors, like endothelin and a decrease in nitric oxide bioavailability[4-6]. The extent of portal hypertension is assessed by the portal pressure[7-8]. Carrying out interventional radiology (IVR) can be the sole method to acquire the hepatic venous pressure gradient (HVPG), which is a substitute indicator for portal pressure that is monitored directly. However, due to its ability to spread when exposed to radiation, it may be more desirable to use noninvasive markers that can be used repeatedly over a lengthy period of time during the clinical course[9,10].

Due to its straightforward and less intrusive nature, ultrasonography (US) is often the preferred imaging technique for the practical treatment of patients with chronic liver disease[11,12]. The Doppler mode allows for the monitoring of blood flow in real-time under normal settings and contrast-enhanced ultrasound with microbubble contrast agents allows for a detailed assessment of blood flow in the peripheral areas. Furthermore, elastography for liver and spleen has a wide range of uses beyond its initial objective of assessing fibrosis. Undoubtedly, this progress is aided by the growth of digital technologies and spread of information. This review article discusses the latest advancements in employing ultrasound (US) for the noninvasive evaluation of portal hypertension, considering the context provided.

MATERIALS AND METHODS

The current investigation was carried out to evaluate the ultrasound results in individuals with portal hypertension. Approval was received from the institutional ethical committee and written consent was obtained after discussing the full research protocol in detail. A grand number of 50 patients with portal hypertension were enrolled. Criteria for excluding participants in the current study were:

- Patients with de-compensated liver diseases
- HIV positive patients
- Patients with presence of hepatocellular carcinoma
- Patients with presence of metastasis in liver

A record was created and all the patients' demographic and clinical information was documented. Ultrasound was performed on all the patients by trained and experienced radiologists. All patients underwent standard blood tests. The data were documented in a Microsoft Excel spreadsheet and evaluated using SPSS software. The chi-square test was employed to evaluate the level of significance.

RESULTS AND DISCUSSIONS

In the present study, evaluation of a total of 30 individuals with portal hypertension was conducted. 50% of the individuals with portal hypertension were over the age of 50. 34.31% of the patients and 16% of the patients with portal hypertension were in the age category of 30-50 years and <30 years, respectively. Portal vein diameter was found to be more than 13 mm in 57.61 percent of the patients while it was less than 13 mm in 45.30 percent of the patients. In the present study, splenic vein diameter was >7 mm in 74.31 percent of the patients while it was <7 mm in 27.60 percent of the patients. Ascites was found to be present in 84.30 percent of the patients while it was found to be absent in 16 percent of the patients. While assessing the ultrasonographic findings among patients divided on the basis of gender, non- significant results were obtained (Table 1 and 2).

In liver cirrhosis, higher resistance to blood flow within the liver causes an increase in pressure in the portal vein, resulting in portal hypertension. After portal hypertension occurs, it affects the blood vessels outside the liver in the digestive and overall circulatory systems, leading to the creation of additional vessels and widening of the arteries. This contributes to the increase in blood flow to the portal vein, which worsens portal hypertension and ultimately leads to

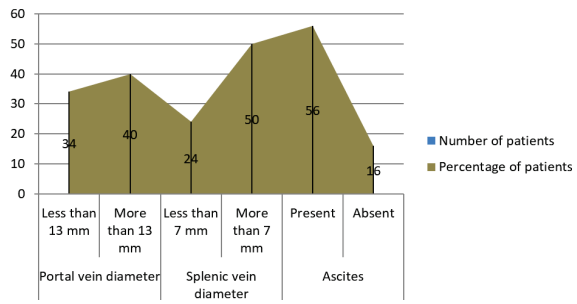

Fig. 1: Ultrasonography findings

Table 1: Ultrasonographic findings

Ultrasound findings		Number of patients	Percentage of patients
Portal vein diameter	<13 mm	17	34
	>13 mm	20	40
Splenic vein diameter	<7 mm	12	24
	>7 mm	25	50
Ascites	Present	28	56
	Absent	8	16

Table 2: Ultrasonographic findings in relation to gender

Ultrasound findings		Males	Females	P- value
Portal vein diameter	<13 mm	14	9	0.13
	>13 mm	16	11	
Splenic vein diameter	<7 mm	11	7	0.32
	>7 mm	19	13	
Ascites	Present	23	12	0.82
	Absent	7	8	

the hyperdynamic circulatory syndrome[13,14]. The existence of portal hypertension may not show any noticeable symptoms, however, the discovery of conditions such an enlarged spleen, fluid accumulation in the abdomen and visible blood vessels on the abdominal wall (caput medusae) clearly indicate its presence. Radiographic imaging techniques, such as Doppler ultrasound and computed tomography, can show the existence of collateral veins, changes in portal venous flow, enlargement of the spleen and accumulation of fluid in the abdomen. These findings help confirm the diagnosis of portal hypertension. However, variceal hemorrhage could be the initial manifestation of portal hypertension and it is crucial to promptly rule out this possibility in patients with suspected liver illness and substantial gastrointestinal bleeding[15,16]. Therefore, this study was conducted to evaluate the ultrasound results in patients with portal hypertension. In the present study, evaluation of a total of 30 individuals with portal hypertension was conducted. Fifty percent of the individuals with portal hypertension were over the age of 50. 33.33 percent of the patients and 16.67 percent of the patients with portal hypertension were in the age category of 30-50 years and <30 years correspondingly. 66.67 percent of the patients with portal hypertension were males, while the remaining 33.33 percent were females. The diameter of the portal vein was > 13 mm in 56.67% of the patients, whereas it was <13 mm in 43.33 percent of the patients. Kaji *et al* examined the ability of noninvasive investigative parameters (clinical, biochemical, radiological) to predict the presence of esophageal varices in patients with portal hypertension (PHT) as in contrast to invasive measurements (upper gastrointestinal endoscopy). Fifty individuals with PHT were examined. A comprehensive medical history was obtained and a physical examination was performed. All patients received the necessary hematological, biochemical, radiological, endoscopic and histo-pathological examinations. Platelet count and splenic size exhibited a notable association with the presence or absence and severity of esophageal varices ($p<0.00015$). If a threshold of 1,000/cu mm is used, then 87.5% (35/40) of patients with esophageal varices have a ratio <1,000, while 20% (2/10) of patients with a ratio less than 1,000 did not have any varices. It was also noticed that the lower the ratio, the higher the degree of varices. The time interval between vessels is a parameter that represents micro-bubble hemodynamics and has a strong correlation with portal pressure. This correlation is observed between the interval time of free portal pressure and the hepatic vein-hepatic artery ($r = -0.804$, $p = 0.009$), as well as the portal vein-hepatic artery ($r = 0.506$, $p = 0.036$). Recent research have shown new measurements for portal pressure. The initial study suggested "regional hepatic perfusion" using SonoVue, which was found to be related to HVPG ($r = 0.279$, $p = 0.041$) and signs of hyperdynamic syndrome. The other study has indicated that the ratio of the time-intensity curve between the portal vein and hepatic artery, the ratio of the strength between the portal vein and hepatic artery and the ratio of the wash-in perfusion slope between the portal vein and hepatic artery are closely correlated with portal pressure. Seventeen to nineteen Sharma MP and colleagues assess the usefulness of live ultrasonography in determining the diagnosis and cause of portal hypertension. Individuals visiting the outpatient department of a specialized medical center were included. There were 324 consecutive patients with portal hypertension caused by cirrhosis (n = 229), non-cirrhotic portal fibrosis (NCPF: n = 64) and extra hepatic portal venous obstruction (EHPVO: n = 31). During this time, 146 individuals with indigestion, 35 with enlarged spleens and 32 with fluid buildup in the abdomen due to various causes served as negative and positive controls. Live ultrasound imaging using a 3.5 MHz linear array scanner was done on all participants while they were fasting. Portal and splenic vein size larger than 10 mm, enlargement of the spleen and the presence of collateral blood vessels around the liver and spleen indicated the presence of portal hypertension. The absence of visibility of the portal vein, which was replaced by a cavernoma, had a diagnostic accuracy of 98% in EHPVO. Non-cirrhotic portal hypertension (NCPF and EHPVO) showed characteristics such as splenic infarcts and the absence of ascites. Sonography has a general diagnosis accuracy

of 80%. A logistic regression study with stepwise selection and multi variate analysis utilizing discriminate function indicated that collaterals at the hepatic and splenic hilum, hepatomegaly, ascites and splenic infarcts were independent indicators for distinguishing between cirrhotic and non-cirrhotic causes of portal hypertension. The equation produced has a discrepancy of 9.8%. Correlations between the sonographic indicators showed that the variceal grade was favorably associated to the existence of splenic hilar collaterals, whereas the liver size was inversely related to the presence of ascites. It was determined that real-time ultrasonography is a precise technique for determining the existence and cause of portal hypertension[20].

CONCLUSION

Based on the findings mentioned above, the authors determine that ultrasound is a reliable diagnostic method for evaluating the seriousness of portal hypertension in patients. However, additional research is suggested.

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