

Sonographic Evaluation Of Portal Vein Diameter In North Indian Population

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Abstract: Background: Portal vein size is a diagnostic index useful in measuring portal hypertension which is found in many disease conditions including cirrhosis where it occurs in > 60% of cases. Aims: The aim of this work is to determine the normal portal vein diameter in adult North Indian population. There is paucity of work describing the portal vein diameter in this population. Method: In this work we used a 2 D ultrasound- a non invasive method to assess the portal vein size in 400 adults aged 20-80 years of both sexes (146 males & 254 females). Results: The mean diameter of normal portal vein in the male subjects was 10.33 mm \pm 1.004 & in female 9.41 mm \pm 1.16. Conclusion: The portal vein diameter obtained in this work is comparable to that found in Caucasians. This information can be useful in diagnosing and treating portal hypertension in a variety of clinical situations. [Gupta E et al NJIRM 2013; 4(2) : 1-4]

Key Words: portal vein, ultrasonography , North Indian population, diameter of portal vein

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Introduction: The portal system includes all the veins which drain the blood from the abdominal part of the digestive tract, spleen, pancreas, and gall-bladder. From these viscera the blood is conveyed to the liver by the portal vein. The portal vein (*vena portae*) is about 8 cm. in length, and is formed at the level of the second lumbar vertebra by the junction of the superior mesenteric vein and splenic vein¹. It passes upward behind the superior part of the duodenum and then ascends in the right border of the lesser omentum to the right extremity of the porta hepatis, where it divides into a right and a left branch, The right branch of the portal vein enters the right lobe of the liver and receives the cystic vein. The left branch, longer but of smaller caliber than the right, gives branches to the caudate lobe, and then enters the left lobe of the liver.

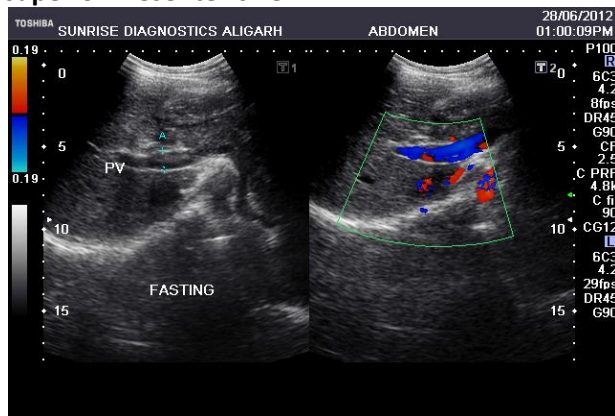
The portal vein is a unique conduit delivering blood from the capillaries in the intestinal wall and spleen to the capillaries in the hepatic sinusoids². It is easily located at the porta hepatis by grey scale ultrasound³ which demonstrates the changes in the main vessels of the portal venous system⁴. The major abnormality of the portal venous system is portal hypertension. It develops when increased resistance to portal flow and/or increased blood flow occur⁵. The result of this mechanism is the enlargement of extrahepatic and intrahepatic portal vessels and the development of spontaneous portosystemic collaterals. Portal venograms, splenoportography and arteriography

have been in use in the evaluation of patients suspected of having portal thrombosis and portal hypertension⁶. These methods though accurate, entail risks, discomfort and are generally time consuming and expensive. They can result in significant morbidity among patients with abnormal coagulation tests and other medical problems. In contrast, ultrasound is well-suited because it is simple, non invasive and accomplished rapidly^{7,8,9,10}. The duplex ultrasound has made the study of the anatomy of the portal venous system as well as the flow rate possible¹¹. Study of the portal vein is also useful in diagnosing many medical conditions. While the medical literature abounds with descriptions of normal and abnormal sonographic portal venous anatomy, little attention has been focused on actual measurements of the portal vein. This information may be particularly important in detecting and evaluating patients with portal hypertension. To obtain this data, we sonographically measured the portal veins in a large series of normal patients.

Materials and Methods: For this study we collected ultrasonographs of apparently healthy adult North Indians from Nov 2011 to April 2012 (six month period) from Sunrise Hospital & Research Centre, Aligarh. This study included individuals of different age groups ranging from 21 to 80 years. A total of 400 individuals (146 Males and 254 females) were studied by transabdominal 2D SIEMENS SONOLINE-2 (SL-2) with a 4.2 MHZ sector probe.

As the study was not conducted in JNMC AMU, but in a registered private research centre and study material was strictly ultrasonographic reports. Moreover the ultrasonography of the patients was conducted not for the purpose of the study but they were advised ultrasonography by their consultants as a part of their Investigation. So IRB permission was not required. Informed consent was obtained from the subjects to use findings of their ultrasound reports in our study. Each subject was scanned in the morning after an overnight fasting and the reason for this is that certain types of food may affect the diameter of the portal vein. The participants were scanned in the supine position and during quiet respiration as suggested by Cosgrove . For the measurement, the transducer was placed transversely at the epigastric region with slight adjustment depending on the position of the pancreas of each subject. When visualization was optimal, measurements were done at the level immediately superior to the head of pancreas, distal to the confluence of splenic vein & superior mesenteric vein. The measurements were obtained lumen to lumen & measured in mm. The data was statistically analysed using unpaired student 't' test with Welch correction. Probability 'p' value ≤0.05 is considered significant.

Figure 1 : Figure showing portal vein diameter measured just distal to the union of splenic vein & superior mesenteric vein



Exclusion Criteria : Subjects with history of hepatobiliary disease, cardiac disorders,

splenomegaly, schistosomiasis and portal hypertension were excluded.

Result : Table 1: Mean diameter of Portal vein (PV) in different age groups of both sexes, measured superior to the confluence of splenic vein & superior mesenteric vein.

Discussion: Ultrasound is important in obtaining information on the condition of the portal venous system in all patients with various medical conditions like chronic liver disease where portal hypertension can be diagnosed since increase in the size of the portal vein is indicative of portal hypertension^{12, 13}. The vein also dilates in schistosomiasis with variable degree of periportal thickening¹⁴. Despite the numerous literatures describing the anatomy of the normal and abnormal portal vein, few studies have specifically dealt with actual sonographic portal vein measurements. The results of the few works done are at variance with each other. This may be due to the age of those recruited for the study, variations of the site of measurement of the portal vein diameter and posture of the subjects¹⁵.

Table 1: Mean diameter of Portal vein

Age Groups (yrs)	Male (Mean ± S.D.)	Female (Mean ± S.D.)
21-30	10.28 ± 0.819	9.39 ± 1.13
31-40	10.38 ± 1.223	9.60 ± 1.59
41-50	9.92 ± 1.098	9.16 ± 0.98
51-60	10.57 ± 1.815	9.56 ± 0.74
>60	10.93 ± 0.643	9.15 ± 1.06
21-80	10.33 ± 1.004	9.41 ± 1.16

In 1982 Jeffery¹⁶ reported mean portal vein diameter to be 11± 2mm in 107 patients. In 1984 Bellamy found that mean diameter of portal vein in fasting state is 7.2 ± 2.3 mm¹⁷. In 1985 Rahim and Adam studied portal vein diameter in 100 patients, mean value in supine position was 7.6 ± 1.5mm¹⁸. According to Rokni Yazdi in 2005, mean portal vein diameter was 8.9 mm¹⁹. Again in 2006 Rokini conducted an ultrasonographic study in 37 Iranian subjects, here mean portal vein diameter measured was 9.36 ± 2.3 mm²⁰. Study to

determine portal vein diameter was conducted by Anakwue A.C. et al in Nigerian population according to which portal vein diameter was $11.45 \pm 1.65 \text{ mm}^{21}$. The earliest work reported a mean diameter of $6.3 \pm 2.3 \text{ mm}$. A more recent work reported a mean diameter of about 13mm^{22} . This is in keeping with the work of Weinreb et al in Caucasians who reported a mean diameter of $11 \pm 2\text{mm}$ in subjects aged 21-40 yrs, with measurements taken just distal to the union of the SV and SMV in right oblique position. This work therefore presents mean diameter of normal portal vein in the male subjects was $10.33 \text{ mm} \pm 1.004$ & in female $9.41 \text{ mm} \pm 1.16$.

Conclusion: This study has demonstrated that the portal vein diameter measurement in male subjects was $10.33 \text{ mm} \pm 1.004$ & in female $9.41 \text{ mm} \pm 1.16$, found to be less than that of Caucasians. Scoble et al found 10 mm to be the upper limit beyond which a diagnosis of portal hypertension should be made²³. This study also concluded sexual dimorphism in portal vein diameter, in female subjects it is significantly less than that of males. No such literature is available in the books, More work is therefore required from other parts of north India to define the portal vein diameter.

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