



## VARIATION IN THE FORMATION OF PORTAL VEIN

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**ABSTRACT** The knowledge about the formation and relations of the portal vein is important for surgeons and radiologists. The variations in the level of formation and the pattern of formation of portal vein might lead to confusions during radiological and surgical procedures. Here we present variations in the formation of the portal vein as found during the routine cadaveric dissections. The portal vein is formed normally by the union of splenic vein, superior mesenteric vein. The inferior mesenteric vein drains the blood from the major part of large intestine and terminates into splenic vein. The abnormal termination of this inferior mesenteric vein into superior mesenteric vein before the formation of portal vein was seen in the cadaver. Identification of these variations is useful in managing traumatic rupture of the mesentery.

**KEYWORDS :** Variations, portal vein, obstruction.

### INTRODUCTION

The portal vein is normally formed by union of the splenic and superior mesenteric veins, around the level of L2, anterior to the inferior vena cava and posterior to the pancreas. It then passes superiorly and runs posterior to the first part of the duodenum. At the porta hepatis it divides into a left and right branch. The portal vein drains blood from all parts of the digestive tract (apart from the lower part of the rectum), the pancreas, spleen and gallbladder. The inferior mesenteric vein opens into the splenic vein. This vein begins as superior rectal vein and drains blood from the left part of the large intestine. It runs along the posterior abdominal wall on the left side of inferior mesenteric artery. Variant portal architecture has been found in 20-35% of individuals.<sup>1,2</sup> Common variations include: (a) trifurcation of the portal vein, where there is absence of the right trunk proper, such that the right anterior and posterior branches stem from the portal trunk at the same point as the left portal vein; (b) the right posterior branch coming off the main portal vein rather than from the right portal vein.<sup>1,2</sup> (c) drainage of inferior mesenteric vein.

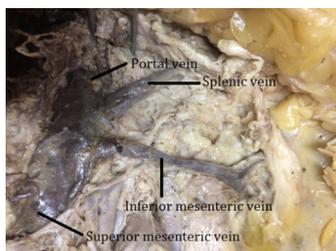
Knowledge of these variations in portal anatomy is important in the preoperative work-up prior to liver transplantation or resection, as knowledge of the individual patients vascular anatomy helps to minimize the likelihood of postoperative liver ischemia.<sup>1</sup> There is also a potential benefit for the interventional radiologist in knowing vascular detail prior to catheter-based interventions.<sup>1</sup> There are several reports on variations on the termination of portal vein in the porta hepatis, but studies on formation of portal vein and its anomalous course are lacking.

### MATERIAL AND METHODS

The study was done in Department of Anatomy, Apollo institute of medical sciences and research, Hyderabad in 16 cadavers used for dissections for undergraduate medical students in Department. The pancreas, liver and spleen were cleared before dissecting for the portal vein and its tributaries. The drainage patterns were observed and variation are noted down.

### RESULTS

Among these 15 cadavers 2 specimens showed variations. A female cadaver about 64 years and a male about 70 yrs showed a variation in the the portal vein. The formation of portal vein is by superior mesenteric and splenic vein. But the inferior mesenteric vein was opening into superior mesenteric and not into splenic vein. All the formative tributaries were carefully dissected and photographs were taken.



### DISCUSSION

The portal vein is variable in its formation and drainage pattern. Identifying deviations from normal portal architecture is important in the work-up for surgery such as liver transplantation, and prior to interventional procedures such as stent placement or embolization. There are several reports on variations on the termination of portal vein in the porta hepatis, but studies on formation of portal vein and its anomalous course are lacking. Bergman et al. have reported the absence of portal vein and opening of superior mesenteric and splenic veins into the renal vein.<sup>3</sup> Jin Shan et al. have reported doubling of the portal vein and its clinical implications.<sup>4</sup>

The drainage pattern of IMV Weinhaus worked on 113 cadavers at university of Minnesota, reported that in 36% cases IMV drained into SV, 41% of IMV drained into SMV and 21% drained into confluence of SMV & SV.<sup>5</sup> Papavasiliou et al studied 300 consecutive computed topography scans and found that 54% cases IMV drained into SV, 27% into SMV while 17% cases drained at confluence.<sup>6</sup> Sakaguchi studied 102 patients undergoing multidetector row computed tomography and found maximum 68% cases IMV drained into SV, 18% into SMV & 7% into junction of SMV & SV.<sup>7</sup>

A preduodenal portal vein is a rare congenital anomaly and has been reported a few times.<sup>5,7</sup> The main clinical significance of a preduodenal portal vein is its association with intestinal obstruction. This can be due to extrinsic compression of the duodenum, or associated intestinal malformations.<sup>11</sup> Up to 80% of the obstructions are due to intrinsic lesions of the duodenum or malrotation.<sup>12</sup> Two-thirds of children with a preduodenal portal vein present in the first week of life. Other associations include biliary atresia, annular pancreas, situs inversus, preduodenal common bile duct and cardiovascular malformations. Inoue et al. have reported a prepancreatic postduodenal portal vein.<sup>13</sup>

In the embryo, the paired vitelline veins transport blood from the yolk sac to the sinus venosus. During the fourth to fifth weeks of embryonic life, three anastomoses form between the vitelline veins,<sup>14</sup> these are the cranial-ventral, dorsal and caudal-ventral anastomoses, and are named according to their anatomical position and relationship to the primitive foregut that will become the duodenum. From the formation of these anastomoses to the third month of development, there is selective involution of the venous network that eventually produces the portal vein. It has been proposed that aberrations in this process of involution can result in anatomical variations within the portal venous system.<sup>15</sup>

In conclusion, the knowledge of variations in the formation and course of the portal vein is very useful for surgeons performing surgeries of pancreas and duodenum. It is also useful in managing the traumatic rupture of the mesentery. Since there are not many studies on variation in the formation of the portal vein, this study might contribute useful data to the literature regarding the same.

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