

VARIATIONS IN THE FORMATIVE TRIBUTARIES OF PORTAL VEIN – A CADAVERIC STUDY

M Venkata Raga Mayuri¹, P Surya Venkata Narayana², N Sreekantha Rao³, T Kavitha⁴

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Corresponding Author:

Dr. Aashay Shah,
Email: ragasmayuri7@gmail.com

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¹Assistant Professor, Department of Anatomy, ACSR Government Medical College, Nellore, Andhra Pradesh, India.

²Associate Professor, Department of Anatomy, Santhiram Medical College, Nandyal, India.

³Associate Professor, Department of Anatomy, ACSR Government Medical College, Nellore, Andhra Pradesh, India.

⁴Assistant Professor, Department of Anatomy, ACSR Government Medical College, Nellore, Andhra Pradesh, India.

ABSTRACT

Background: Portal vein is the major vessel supplying nutrient rich blood from gut to the liver and any structural abnormalities will have impact on nutrient absorption. Increase in Portal vein pressure is a direct indication of structural abnormality of liver. Liver diseases and their complications share a major part in health sector and the common cause for liver disease is viral hepatitis. Chronic hepatitis may result in portal hypertension. Mortality due to complications secondary to portal hypertension can be prevented by early diagnosis using standard method of recording hepatic venous pressure gradient (HVPG). **Aim and objectives:** To observe the formative tributaries of portal vein in human cadavers. To identify significant variations in the formation of Portal Vein. **Materials and Methods:** 30 adult human cadavers from anatomy dissection hall, ACSR government medical Nellore, Andhra Pradesh were dissected under aseptic precautions. The variations in the formation of portal vein were identified and reported in this study. **Result:** In 26 cadavers the portal vein was formed by the union of Superior mesenteric vein (SMV) and Splenic vein (SV); Inferior mesenteric vein (IMV) was draining in to the splenic vein. In three cadavers, portal vein was formed by the union of three veins SMV, SV and IMV. In one cadaver, Portal vein was formed by union of Splenic vein and a Common trunk formed by Superior mesenteric vein and Inferior mesenteric vein. In two cadavers, Portal vein formed by union of Splenic vein and Superior mesenteric vein, inferior mesenteric vein draining in to superior mesenteric vein. **Conclusion:** The variations observed in our study are in close correlation with wide literature available on portal vein anatomical variations. Knowing the common and rare variations of portal vein and identifying these variations prior to surgery using adequate imaging techniques is mandatory for surgeons to plan accurate decompression shunt surgeries as a treatment of choice in cases of portal hypertension not responding to medical line of treatment.

INTRODUCTION

Liver diseases and their complications share a major part in health sector and the common cause for liver disease is viral hepatitis.^[1] Chronic hepatitis may result in portal hypertension. Mortality due to complications secondary to portal hypertension can be prevented by early diagnosis using standard method of recording hepatic venous pressure gradient (HVPG).^[2,3] Significant complications in portal hypertension are clinically observed only after a HVPG of more than 12 mm Hg.^[4] In cases of portal hypertension not responding to medical line of management, Transjugular intrahepatic shunt

surgeries (TIPS) are treatment of choice.^[5] Spleno-Renal Portosystemic shunt surgeries are also considered as treatment of choice in cases of portal hypertension where medical line of treatment has failed.^[6] Portosystemic shunt surgeries and TIPS are promising choice of treatment in complicated portal hypertension.^[7] Portal vein is the major vessel supplying nutrient rich blood from gut to the liver and any structural abnormalities will have impact on nutrient absorption. Increase in Portal vein pressure is a direct indication of structural abnormality of liver. The present study is undertaken to observe the variations in the formative tributaries of portal vein, which plays an important role in planning the surgical procedure for treatment of portal hypertension. In this

study we aimed at observing the formative tributaries of the portal vein in human cadavers. Our objective was to identify the significant variations in the formation of portal vein.

MATERIALS AND METHODS

The study was undertaken after obtaining approval from Institutional Ethical committee, ACSR government medical college, Nellore. 30 adult human cadavers were dissected under aseptic precautions. Portal vein formation was carefully studied and pictures were obtained using DSLR camera with high resolution. The variations in the formation of portal vein were identified and compared with previous data and significant variations in the formative tributaries of portal vein are reported in this study.

RESULTS

In the present study, 30 adult human cadavers of both sexes were used to study the variations in the formative tributaries of portal vein. The following observations were made, out of 30 cadavers under study, in 26 cadavers the portal vein was formed by the union of Superior mesenteric vein (SMV) and Splenic vein (SV); Inferior mesenteric vein (IMV) was draining in to the splenic vein [fig 1]. In 3 cadavers, portal vein was formed by the union of three veins SMV, SV and IMV [fig 2]. In one cadaver, Portal vein was formed by union of Splenic

vein and a Common trunk formed by Superior mesenteric vein and Inferior mesenteric vein [fig 3]. In 25 cadavers IMV was draining into splenic vein, in 3 cadavers IMV was involved in formation of portal vein along with SMV and SV [fig 2], in 2 cadavers IMV was draining into SMV [fig 4].

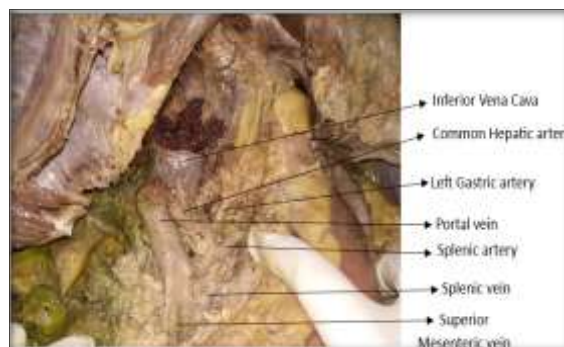
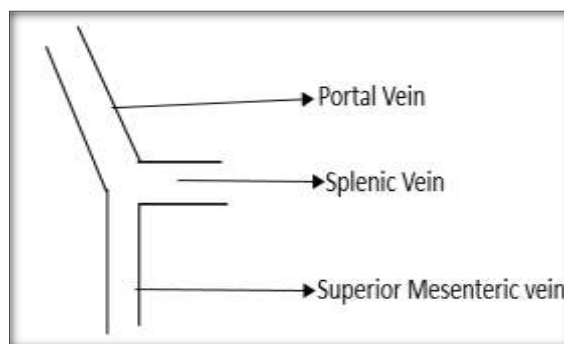


Figure 1: Normal formation of Portal vein



Drawing 1: Schematic pattern for Figure 1

Table 1: Various Patterns of Portal vein formation

Patterns observed	Number of Cadavers	Percentage
SMV + SV	26	86.6%
SMV + SV + IMV	3	10%
SV + Common trunk formed by (SMV + IMV)	1	3.3%

Table 2: Various patterns of Inferior mesenteric vein termination

Patterns observed	Number of Cadavers	Percentage
IMV terminating in Splenic vein	25	83.3%
IMV terminating as formative tributary of portal vein along with SV and SMV	3	10%
IMV terminating in SMV	2	6.6%

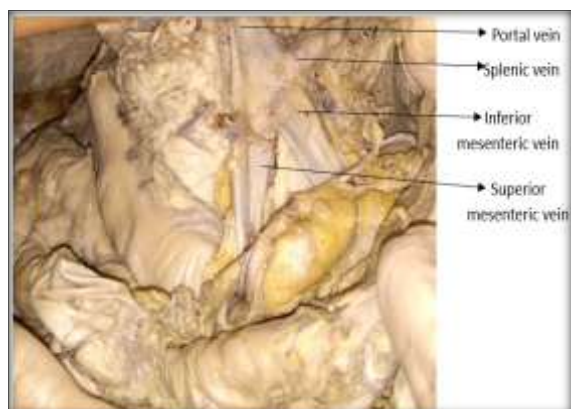
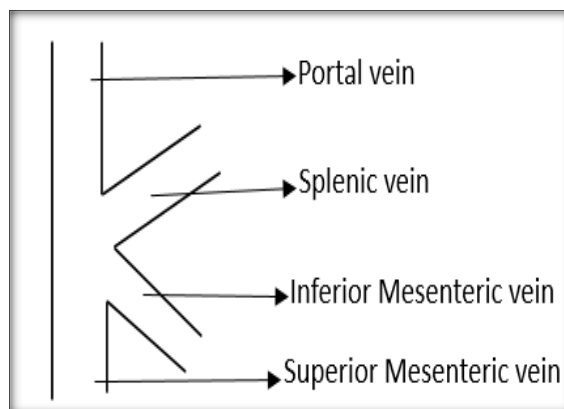


Figure 2: Three veins (Superior mesenteric vein, Inferior Mesenteric Vein, Splenic Vein) forming Portal vein and sketch showing the pattern



Drawing 2: Schematic pattern for Figure 2

DISCUSSION

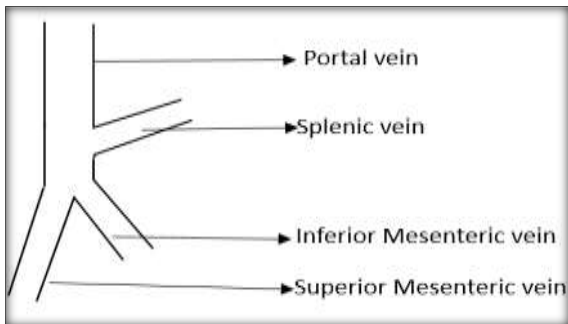
The present study is undertaken to identify the variations in the formative tributaries of portal vein. Knowing the common and rare variations in the formation of portal vein helps the surgeon to plan for appropriate portosystemic shunt procedure. In this study, we observed three patterns of formation of portal vein, in 26(86.6%) cadavers PV is formed by SMV and SV, in 3(10%) Cadavers by SMV, SV and IMV, in one (3.3%) cadaver SV and Common trunk formed by IMV and SMV. Yang et al. reported a rare variant of duplication of portal vein in which left branch of PV originated from splenic and the vein formed by joining of SV and SMV continued as Right branch of Portal vein.^[8] Carneiro et al. in their study mentioned that in IMV drains into SV (40%), SMV (40%) and in remaining 20% IMV contributed in formation of PV along with SV and SMV.^[9] In our study, IMV drains into SV (83.3%), SMV (6.6%) and in remaining 10% IMV contributed in formation of PV along with SV and SMV. Neto et al. in their review presented 12 types of variants in portal vein formation,^[10] in our study commonest was type 1(SMV and SV forming PV and IMV draining into SV), next frequent variation was type 2 (SMV,SV and IMV together forming PV), least common was type 3(SMV and SV forming PV, IMV draining into SMV). Tyagi et al. reported that in congenital absence of PV, SMV and SV drain into Systemic veins,^[11] in our study PV was present in all subjects. Hu et al. in their review presented 3 types of developmental anomalies associated with portal system, type 1 is complete absence of PV and SMV, SV draining into inferior vena cava (IVC), type 2 PV directly draining into IVC bypassing the liver, type 3 presence of a Porto caval shunt connecting PV to IVC.^[12] Kurtcehajic et al. reported that portal vein aneurysm can arise congenitally due to incomplete regression of vitelline veins (most commonly right).^[13] Nayak et al. reported a rare variation in which first jejunal vein was draining into PV and IMV draining into first jejunal vein.^[14] Du et al. reported a case of duplicated PV in which one PV was formed by SMV and SV, second portal vein originated from SMV.^[15] Demir reported peripancreatic post duodenal portal vein.^[16]

CONCLUSION

The variations observed in our study are in close correlation with wide literature available on portal vein anatomical variations. Knowing the common and rare variations of portal vein and identifying these variations prior to surgery using adequate imaging techniques is mandatory for surgeons to plan accurate decompression shunt surgeries as a treatment of choice in cases of portal hypertension not responding to medical line of treatment. We conclude that irrespective of vast literature available on portal venous system and latest updates on



Figure 3: Portal vein formed by Splenic vein and a Common trunk formed by Superior mesenteric vein and Inferior mesenteric vein



Drawing 3: Schematic pattern for Figure 3

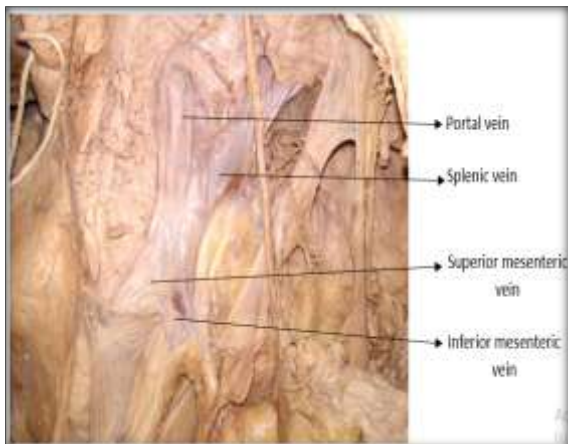
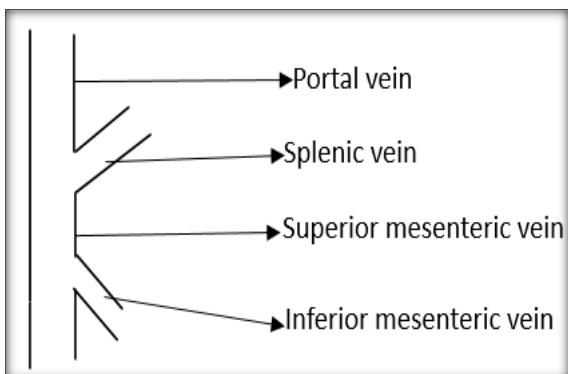


Figure 4: Portal vein formed by union of Splenic vein and Superior mesenteric vein, inferior mesenteric vein draining in to superior mesenteric vein



Drawing 4: Schematic pattern for Figure 4

evolving diagnostic and therapeutic techniques. The application of these techniques to successfully treating rare variants of portal vascular anomalies is still not reachable to all categories of patients in our country. Along with knowledge of these variations elaborate hands-on training for surgeons is instrumental in our health care delivery system.

Study limitations: In present study, we concentrated on variations in the formative tributaries of the portal vein. The detailed branching pattern of portal vein both intra-hepatic and extrahepatic is not included in the present study. The branching pattern shall be studied in detail in further research projects by integrating with radiology and surgical experts, as intrahepatic branching pattern is difficult to study in cadavers.

Conflict of interest: The authors declare that there is no conflict of interest

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