

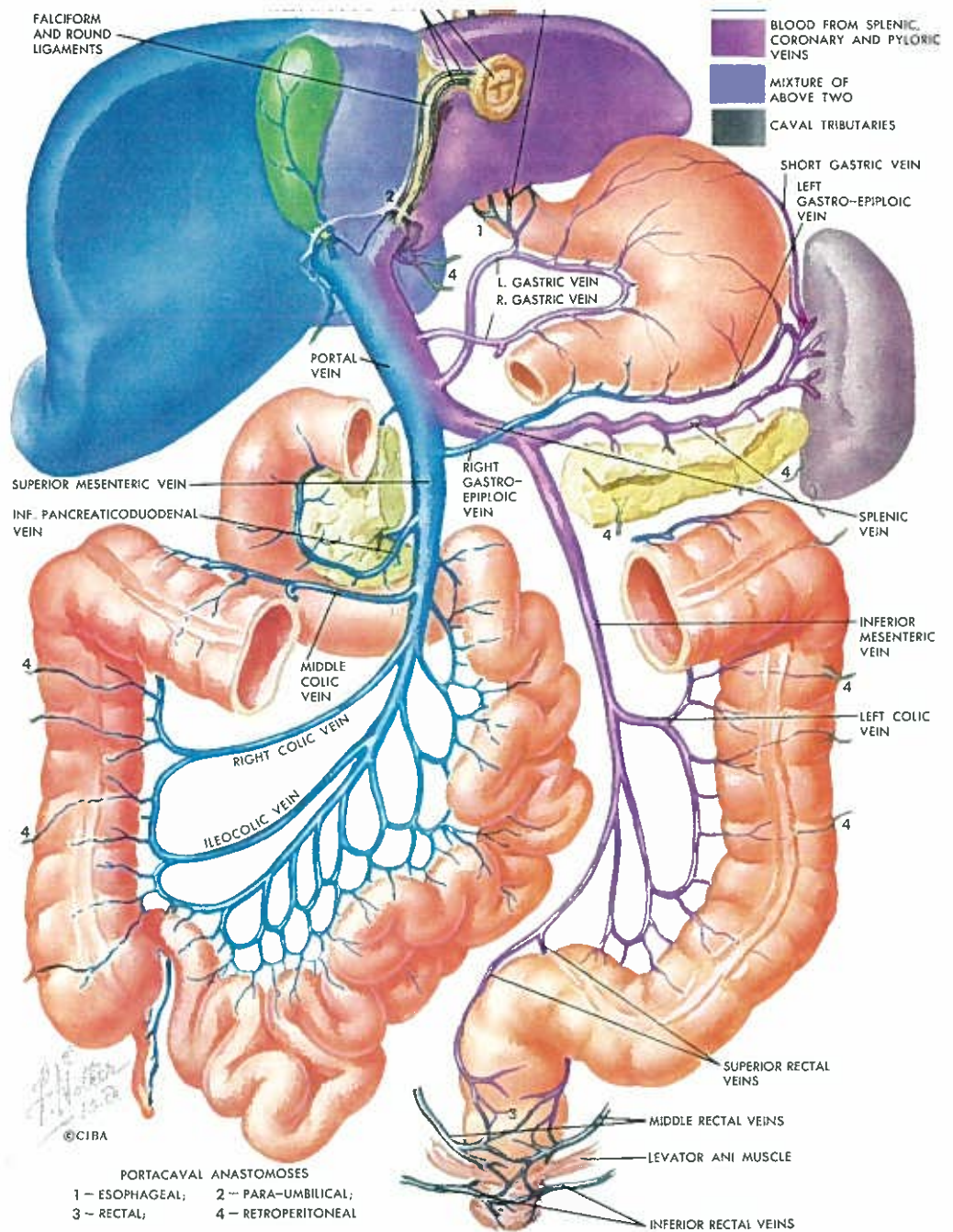
PORTAL VEIN TRIBUTARIES, PORTACAVAL ANASTOMOSES

The portal vein forms behind the head of the pancreas at the height of the second lumbar vertebra by confluence of the superior mesenteric and splenic veins. It runs behind the first portion of the duodenum and then in the right border of the lesser omentum to the porta hepatis, where it splits into its hepatic branches. The portal vein receives the *left gastric (coronary) vein* which communicates with the esophageal venous plexus. The latter, in turn, connects with the *short gastric veins*, the *azygos* and *hemi-azygos* veins in the lower and middle parts and with various branches of the superior vena cava, such as the *innominate* and *inferior thyroid* veins in the upper part of the esophageal region. The portal vein further accepts the *right gastric (pyloric) vein* which with the *left gastric (coronary) vein* forms a loop. The left main branch of the portal vein admits the *para-umbilical* veins and, occasionally, a persisting *umbilical vein*.

The *superior mesenteric vein*, one of the constituents of the vena portae, originates at the root of the mesentery, mainly from the *middle colic*, *right colic* and *ileocolic* veins, receiving in addition many small veins. It runs in front of the third portion of the duodenum and receives the *inferior pancreaticoduodenal vein*. The *right gastro-epiploic vein* coming from the right aspects of the greater curvature of the stomach enters the superior mesenteric vein.

The *splenic vein* usually receives the *inferior mesenteric vein* behind the body of the pancreas (see also page 28). The inferior mesenteric vein starts with the *superior rectal veins* and continues in the posterior abdominal wall, receiving many tributaries, especially the *left colic vein*. The splenic vein begins at the hilus of the spleen and admits the *left gastro-epiploic vein*, *short gastric veins* (both communicating with esophageal veins) and *pancreatic veins* which anastomose with retroperitoneal veins, thus with the caval system.

The shortness of the main stem of the portal vein prevents under certain cir-



cumstances mixing of the blood coming from its constituents, so that the right extremity of the liver may receive chiefly blood coming from the superior mesenteric vein. The left lobe may receive blood from the left gastric (coronary), inferior mesenteric and splenic veins, whereas the left part of the right lobe, including the caudate and quadrate lobes, receives mixed blood. These streamlines, demonstrated in experimental animals, are not seen during portal venography and are not certain to occur in the human being. Their existence has been assumed, however, to explain the localization of tumor metastases and abscesses and also the predominance of massive necrosis in acute fatal viral hepatitis in the left lobe, which supposedly does not receive nutrient-rich protective blood from the small intestine.

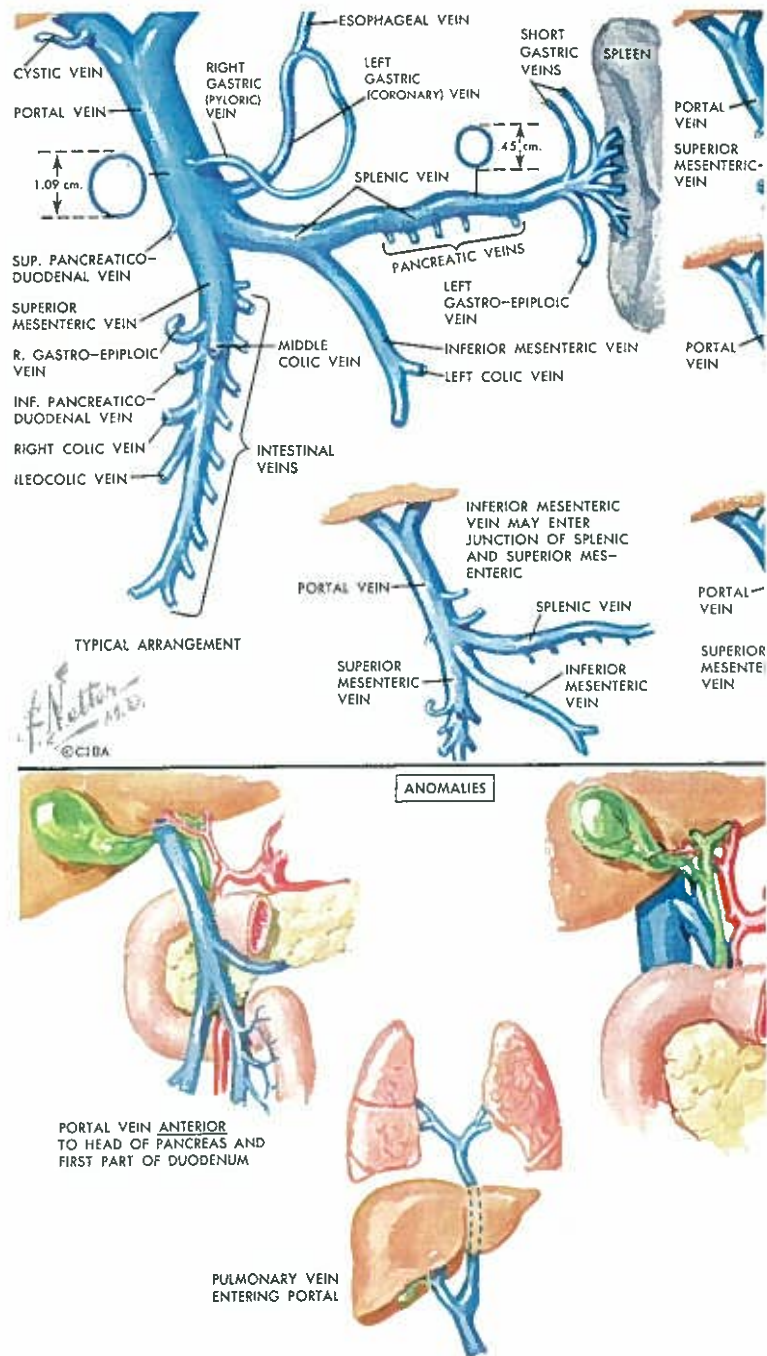
The portacaval anastomoses have great clinical significance. They dilate when the blood flow in the

portal vein and through the liver is restrained; they relieve portal hypertension (see pages 71, 73 and 74) and may be lifesaving in acute portal hypertension but, as in chronic obstruction, may shunt blood from the liver, depriving the organism of the liver's vital functions and, therewith, they contribute to hepatic insufficiency. Dilatation of the rectal veins results in hemorrhoidal piles, with the danger of hemorrhage, thrombosis and inflammation. The varicosities of the esophageal veins (and less so of the cardiac veins of the stomach) may lead to esophageal hemorrhage, the most dangerous complication of portal hypertension (see page 72). The various *retroperitoneal varicose portacaval anastomoses* have less clinical significance. The *para-umbilical anastomoses* lead to a marked dilatation of the veins in the anterior abdominal wall. If these veins converge toward the umbilicus, they form what is called "caput medusae".

PORTAL VEIN

Variations and Anomalies

The anatomy of the portal vein system is said to reveal less major anatomic variations than the hepatic arterial system. Nevertheless, the newly developed shunt operations for portal hypertension (see page 73) have created considerable interest in the anatomy of the portal vein, and dissections of several groups in a great number of individuals have indicated frequent minor variations of surgical importance. The length of the portal vein varies between 5.5 and 8 cm., with an average of approximately 6.5 cm., the mean diameter being normally 1.09 cm. In cirrhosis, however, the diameter is considerably wider. It is of practical importance that in only slightly over 10 per cent of the studied cases no vessel enters the main stem of the portal vein, but that in the vast majority several veins are admitted which may be torn during the dissection for portacaval anastomoses. Dangerous hemorrhage may result, and their ligation may interfere with the size of the portal vein and the performance of the anastomosis. In more than two thirds of the cases the *left gastric vein*, which is of major significance as portal drainage from esophageal varices, enters into the left aspect of the portal vein. Otherwise it enters at the junction of the *splenic and superior mesenteric veins*, while in almost one fourth of the cases it joins the *splenic vein*. Under all these circumstances the *pyloric vein* may enter into the portal vein stem. On its right aspect the portal vein may admit the *superior pancreaticoduodenal vein*, and close to the liver the *cystic vein*, which frequently joins the right branch of the portal vein. The usual anatomic



description of the formation of the portal vein is found only in about half of the cases. In the remainder the *inferior mesenteric vein* enters the junction of splenic and superior mesenteric veins or joins the *superior mesenteric vein*.

The size of the splenic vein, of major importance in splenorenal shunt, is said to average less than $\frac{1}{2}$ cm. between the splenic hilus and the junction with the inferior mesenteric vein. As a rule the splenic vein is widened to a lesser degree in portal hypertension than is the portal vein. Since the splenic vein is more or less embedded into the cephalic portion of the pancreas, the many pancreatic venous tributaries are so short that they may be easily torn during shunt operation, and their ligation again creates technical problems.

Of the rare congenital anomalies the one of surgical significance is the one of surgical significance position anterior to the head of the duodenum. Another rare finding anomaly is the entrance of the inferior vena cava into the inferior vena cava. In morphologically normal anatomy without portal vein blood hepatic artery is considered as an entrance of the pulmonary vein, probably the consequence in the development of the fetal stage (see page 2). congenital strictures of the hepatic vein, producing severe portal hypertension may not be relieved by shunt