22.7D: Blood Supply to the Liver

In the hepatic portal system, the liver receives a dual blood supply from the hepatic portal vein and the hepatic arteries.

Learning Objectives

• Outline the blood flow to and from the liver

Key Points

• The hepatic portal vein supplies 75% of the blood to the liver, while the hepatic arteries supply the remaining 25%.
• Approximately half of the liver’s oxygen demand is met by the hepatic portal vein, and half is met by the hepatic arteries.
• The hepatic portal system connects the capillaries of the gastrointestinal tract with the capillaries in the liver. Nutrient-rich blood leaves the gastrointestinal tract and is first brought to the liver for processing before being sent to the heart.

Key Terms

• hepatic arteries: A blood vessel that supplies oxygenated blood to the liver.
• hepatic portal vein: A vessel located in the abdominal cavity that is formed by the union of the superior mesenteric and splenic veins that channel blood from the gastrointestinal tract and spleen to the capillary beds in the liver.
• cofactors: A substance, especially a coenzyme or a metal, that must be present for an enzyme to function.

In the hepatic portal system, the liver receives a dual blood supply from the hepatic portal vein and hepatic arteries. The
hepatic portal vein carries venous blood drained from the spleen, gastrointestinal tract and its associated organs; it supplies approximately 75% of the liver’s blood. The hepatic arteries supply arterial blood to the liver and account for the remainder of its blood flow.

Oxygen is provided from both sources; approximately half of the liver’s oxygen demand is met by the hepatic portal vein, and half is met by the hepatic arteries. Blood flows through the liver tissue and empties into the central vein of each lobule. The central veins coalesce into hepatic veins that collect the blood leaving the liver and bring it to the heart.

Hepatic veins: An image of a liver with the hepatic veins labeled. They are located in the inferior vena cava.

A portal system is a venous structure that enables blood from one set of capillary beds to drain into another set of capillary beds, without first returning this blood to the heart. The majority of capillaries in the body drain directly into the heart, so portal systems are unusual.

The hepatic portal system connects the capillaries of the gastrointestinal tract with the capillaries in the liver. Nutrient-rich blood leaves the gastrointestinal tract and is first brought to the liver for processing before being sent to the heart. Here, carbohydrates and amino acids can be stored or used to make new proteins and carbohydrates.

The liver also removes vitamins and cofactors from the blood for storage, as well as filters any toxins that may have been absorbed along with the food. When any of these stored substances are needed, the liver releases them back into circulation through the hepatic veins.
Hepatic portal circulation: A diagram that shows the hepatic portal vein and its territory.